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Building and Retaining the Career Force: New Procedures for Accessing and Assigning Army Enlisted Personnel Annual Report, 1991 Fiscal Year

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13. ABSTRACT *(Maximum 200 words)*

The Career Force research project is the second phase of a two-phase Army program to develop a selection and classification system for enlisted personnel based on expected future performance. In the first phase, Project A, a large and versatile data base, was collected from a representative sample of Military Occupational Specialties (MOS) and used to (a) validate the Armed Services Vocational Aptitude Battery (ASVAB) and (b) develop and validate new predictor and criterion measures representing the entire domain of potential measures. Building on this foundation, Career Force research will finish developing the selection/classification system and evaluate its effectiveness, with emphasis on assessing second-tour performance. This second year of the project emphasized building the data file for the Longitudinal Validation cohort, developing the basic scores for the final versions of the Experimental Predictor Battery and the first-tour performance measures, and carrying out the basic longitudinal validation.

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FOREWORD

This document is a description of the research activities conducted during the second year of the project Building the Career Force. This project is the second phase of a research program of unprecedented scope and depth to provide the basis for improving the Army's selection and classification procedures, as well as improving reenlistment and promotion decisions for soldiers up to the level of sergeant. The thrust for this program came from the practical, professional, and legal need to validate the Armed Services Vocational Aptitude Battery (ASVAB--the current U.S. military selection/classification test battery) and other selection variables as predictors of training and performance. The authorization for the program was provided in a letter, Deputy Chief of Staff for Operations, "Army Research Project to Validate the Predictive Value of the Armed Services Vocational Aptitude Battery," effective 19 November 1980, and a Memorandum, Assistant Secretary of Defense, Manpower Reserve Affairs and Logistics (MRA&L), "Enlistment Standards," effective 11 September 1980.

The research program began in 1982 with an effort known as Project A. Project A not only validated the ASVAB against job performance; it further linked indicators of temperament (achievement, discipline, stress tolerance), psychomotor ability (e.g., eye-hand coordination), and spatial ability to job performance. Project A developed new tools for a variety of personnel decisions. Before these tools can be optimally used, however, two critical questions need to be answered: (1) What combinations of aptitude, temperament, psychomotor ability, and spatial ability, measured at or before entry into the Army, best predict later performance in individual military occupational specialties (MOS)? (2) Which indicators of first-tour performance best predict performance in the second tour? These questions will be answered in Building the Career Force.

The second-year Building the Career Force activities described herein continued analyses of the combined set of initial entry predictor measures developed for selection and classification purposes and end-of-training and first-tour job performance measures to be linked to these predictor measures. Preliminary second-tour measures were refined and administration was begun to a sample already tested on initial entry, end-of-training, and first-tour measures. After administration of the second-tour measures is completed in 1992, it will be possible to examine longitudinal linkages across the full set of measures, from initial entry to second tour. This will provide an information base for setting selection, classification, reenlistment, and promotion policies unrivaled anywhere.

Active sponsorship of this effort has been provided by the Director of Military Personnel Management (DMPM). The DMPM has been periodically briefed on the activities described herein and has personally taken part in the execution of this project in an extremely effective manner. To ensure that Building the Career Force research achieves its full scientific potential, an advisory group composed of experts in personnel measurement, selection, and classification was established to provide continuing guidance on technical aspects of the research. Members of this Scientific Advisory Group include Philip Bobko, Lloyd Bond, Milton Hakel (Chair), Lloyd Humphreys, Lawrence Johnson, Robert Linn, Mary Tenopyr, and Jay Uhlaner.

EDITORS' PREFACE

This is the second annual report for work completed as part of the Building the Career Force project. It also constitutes the primary technical report of the work completed on several of the project's principal tasks. Consequently, it is a "stand alone" document for Fiscal Year 1991 and does not refer the reader to more detailed descriptions in supplementary reports. The Career Force project extends the major work on selection and classification of Army enlisted personnel that was completed as part of Project A.

The Career Force project includes (1) a replication and extension of the Experimental Battery validities for the selection and classification of first-tour enlisted personnel; (2) validation of the Experimental Battery against end-of-training performance; (3) validation of training performance as a predictor of first-tour job performance; (4) measurement of second-tour performance; (5) validation of the Armed Services Vocational Aptitude Battery (ASVAB), the Experimental Battery, Advanced Individual Training (AIT) performance, and first-tour performance as predictors of second-tour performance; and (6) identification of the optimal predictor battery for selection and classification, given certain specific sets of goals and constraints.

The annual report for year one described the results of a series of analyses directed at basic score development for (1) the Experimental Predictor Battery, (2) the End-of-Training performance measures, and (3) the second-tour job performance measures that were administered to the second-tour Concurrent Validation sample (CVII). The performance data from this initial sample of second-tour junior noncommissioned officers were also used to develop a latent structure model of second-tour performance. The model hypothesizes six basic components for NCO performance.

This Research Note deals with the analysis of performance data from the Longitudinal Validation I (LVI) sample, which is a sample of approximately 10,000 first-tour incumbents who entered the Army during 1986/87. It is the second of the two major cohorts of enlisted personnel that make up the total Project A/Career Force project data base. The criterion score development, data editing, and performance modeling analyses are each described in turn. After the performance factor scores have been finalized, the remainder of the report deals with the basic Longitudinal Validation of the ASVAB and the Project A Experimental Predictor Battery against (1) training performance, (2) first-tour job performance, and (3) second-tour job performance (i.e., the second-tour performance factor scores developed during year one).

The basic building blocks are now in place for (1) development of "optimal" prediction equations, given constraints; (2) estimation of potential differential prediction/classification validity; and (3) analysis of the tradeoffs among alternative selection and classification goals. The results of these analyses will be the topics of subsequent reports.

As was the case for year one, the writing of this report was very much a collaborative effort by a lot of people. The primary authors for each chapter are indicated in the Table of Contents and also on the first page of each chapter. The editors, and the management, are deeply appreciative of their contributions.

BUILDING AND RETAINING THE CAREER FORCE: NEW PROCEDURES FOR ACCESSING AND ASSIGNING ARMY ENLISTED PERSONNEL
ANNUAL REPORT, 1991 FISCAL YEAR

EXECUTIVE SUMMARY

Requirement:

The Building the Career Force project is the second phase of a comprehensive, long-term research program, sponsored by the Deputy Chief of Staff for Personnel, to provide the basis for improving the selection and assignment of Army enlisted personnel. In the first phase, known as Project A, existing selection measures were validated against both existing and newly developed performance criteria, and new predictive measures were developed to aid in assignment and promotion decisions. The Career Force project extends the research on measuring second-tour job performance and is examining how selection and classification tests administered before a soldier's first enlistment can, with measures of performance during that enlistment, predict performance potential for second-tour duty.

Procedure:

In Task 1, measures developed in Project A to assess the performance of second-tour soldiers have been revised and are being tested with the Longitudinal Validation sample first tested in Project A. (These second-tour soldiers have been in the Army from 41 to 63 months.) The results from these tests are being used to complete the predictive validation of the Armed Services Vocational Aptitude Battery (ASVAB) and the Project A Experimental Predictor Battery against training success measures and first-tour job performance tests, and of all of these measures against the criteria for successful second-tour performance.

The Task 2 staff has established, and is managing, an integrated research data base (IRDB), processing Project A and Career Force data and merging files with unrelated military data.

Task 3 covers all analyses to be performed under this project to develop the analytic framework needed to evaluate equations for predicting training performance, first-tour performance and attrition, reenlistment, and second-tour performance.

Findings:

The pattern of results from the basic analyses of Longitudinal Validation tests was highly consistent with the results from the earlier Concurrent Validation tests for both predictor and performance scores. For example, the model of first-tour performance that best fit the Longitudinal Validation data was the model generated from the Concurrent Validation testing.

Similarly, the models for training performance and for second-tour performance that have so far been developed from the Longitudinal Validation data have strongly confirmed the earlier findings. The description of the latent structure of performance as individuals move from training through their first tour and into their second tour is highly consistent.

The ASVAB was again shown to be a very good predictor of the "will do" component of performance as well as a reasonably good predictor of the effort and leadership aspect of performance.

Utilization of Findings:

The findings from the basic validation stage will be used to consider a variety of issues inherent in optimal prediction of performance. The long-term results from these developmental and validation processes will be applied in an improved system for selecting and assigning Army manpower in a changing military environment.

BUILDING AND RETAINING THE CAREER FORCE: NEW PROCEDURES FOR ACCESSING AND ASSIGNING ARMY ENLISTED PERSONNEL
ANNUAL REPORT, 1991 FISCAL YEAR

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NEW PROCEDURES FOR ACCESSING AND ASSIGNING ARMY ENLISTED PERSONNEL

ANNUAL REPORT, 1991 FISCAL YEAR

Chapter 1
INTRODUCTION

John P. Campbell and James H. Harris

This report is a summary of the major activities undertaken during the second year of a Department of the Army research project entitled Building and Retaining the Career Force. The report covers the period from 1 October 1990 through 30 September 1991. The research reported was conducted by a consortium comprised of Human Resources Research Organization (HumRRO), American Institutes for Research (AIR), and Personnel Decisions Research Institute, Incorporated (PDRI, Inc.), and the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI).

The research effort is the second phase of a two-phase program to develop a selection and classification system for enlisted personnel, based on expected future performance. Phase One was Project A (Campbell & Zook, 1990, 1991). Its goals were to validate the Armed Services Vocational Aptitude Battery (ASVAB) by collecting data from a representative sample of Military Occupational Specialties (MOS), and to build a large and versatile data base by developing and validating new predictors and criterion measures that represented the entire domain of potential measures. The goals of Building the Career Force are to determine the longitudinal relationship between the new predictors and first-tour performance, to finalize and administer the measures of second-tour job performance, and to examine how selection and classification tests administered before a soldier's first enlistment, in conjunction with performance during that soldier's first enlistment, predict performance in a second enlistment.

The remainder of this chapter describes the objectives and organization of the project, summarizes the work completed during the first 15 months, and outlines the content to be included in this second annual report.

BUILDING THE CAREER FORCE: OBJECTIVES AND PROJECT DESIGN

The Project A data base, the predictor and criterion measures the project developed, the working models it provided, and its basic analytic work have provided a valuable foundation for the further production of scientific findings and operational products, and for the subsequent investigation of reenlistment decisions, noncommissioned officer (NCO) job performance, NCO promotion decisions, and the identification of NCO potential.

The work encompassed by the Career Force project is intended to accomplish several general goals relevant to building and retaining the career force:

(1) Build the final pieces required for a complete selection/classification decision-making system.

(2) Provide the analytic procedures and data required to maximize the system's performance and evaluate its effectiveness.

(3) Build the foundation for its implementation.

The principal focus is on the greatest possible gains in overall individual performance, for both "can do" and "will do" components of performance, that can be obtained from enhancing the selection/classification system for first- and second-tour enlisted personnel. Maximizing the benefit from a more effective match of people and jobs has always been a goal of the Army personnel system. Given the population demographics for the United States during the coming decade, this goal becomes even more crucial. It is incumbent on virtually every organization to go as far as the state-of-the-art will allow.

This means that the information that is used to make personnel decisions must yield the maximum gain in terms of accuracy and fairness of predictions. It means that the models and procedures used to execute selection and classification decisions must both serve the goals of the organization and maximize the aggregate benefits that can be obtained from using the selection/classification measures (e.g., new computerized tests). It means that the implementation of the system, or any part of it, must serve the needs of the users and also maintain fidelity with the goals on which the system is based.

Specific Research Objectives

The specific scientific objectives of Building the Career Force are to

(1) Develop a complete array of valid and reliable measures of second-tour performance as an Army NCO, using the Project A prototypes as a starting point.

(2) Carry out a complete incremental predictive validation of (a) the ASVAB and the Project A Experimental Battery of predictors, (b) measures of training success, and (c) the full array of first-tour performance criteria developed as part of Project A. The criteria against which these three sets of predictors will be validated, both individually and incrementally for each major criterion component, are the second-tour job performance measures.

(3) Develop a model of second-tour NCO performance that parallels the first-tour performance model from Project A and that identifies the major components of second-tour performance, provides information on their construct validity, and establishes how the major components of performance should be combined for specific prediction or interpretation purposes.

(4) Develop the analytic framework needed to evaluate the optimal prediction equations for predicting (a) training performance; (b) first-tour performance; (c) first-tour attrition and the reenlistment decision; and (d) second-tour performance, under the conditions when testing time is limited to a specified amount and

when there must be a tradeoff among alternative selection/classification goals (e.g., maximizing aggregate performance vs. minimizing discipline and low-motivation problems vs. minimizing attrition).

(5) Design and develop a fully functional and user-friendly research data base that includes all relevant personnel data on 1981/82, 1983/84, and 1986/87 accessions, including all Project A and Career Force Project data and all relevant Enlisted Master Files (EMF), Accession File, and Army Training Requirements and Resources System (ATRRS) available data.

Project Organization

To reflect the requirements of the research, the project is organized as shown in Figure 1.1. Management of the total project is the responsibility of the Project Director. The overall design, execution, and evaluation of the substantive tasks are the responsibility of the Principal Scientist. Oversight and scientific participation are provided by the Army Research Institute. Guidance is provided by the General Officers Steering Committee and the Scientific Advisory Group.

A brief summary of the work encompassed by the three substantive technical tasks follows:

Task 1 is to revise the measures developed in Project A to measure second-tour soldier performance. The second-tour performance measures were revised and were administered to the Project A Longitudinal Validation (LV) sample, beginning in June 1991. At that time, the soldiers in the sample were in their second tour, and had been in the Army anywhere from to 63 months. Once these measures have been administered, and the data analyzed (under Task 3), it will be possible to complete the incremental predictive validation of the ASVAB and the Project A Experimental Battery, the measures of training success, and the full array of first-tour performance measures developed in Project A, against the second-tour criterion measures.

Task 2 has a single purpose--to establish, manage, and safeguard an integrated research data base (IRDB) on the National Institutes of Health IBM computer system. As part of the establishment of the IRDB, Task 2 will integrate the Project A longitudinal research data base, extract and merge data from other military data bases, process data collected by Project A and this project, and create workfiles for analyses.

Task 3 is responsible for all analyses performed under this project. The task is organized around the five major data sets to be analyzed. The data sets are the Longitudinal Validation predictor data (LV), the Longitudinal Validation end-of-training (EOT) data, the Longitudinal Validation first-tour data (LVI), the Concurrent Validation second-tour data (CVII), and the Longitudinal Validation second-tour data (LVII). At the end of the project, Task 3 will have developed the analytic framework necessary to evaluate optimal prediction equations to predict training performance, first-tour performance and attrition, reenlistment, and second-tour performance.

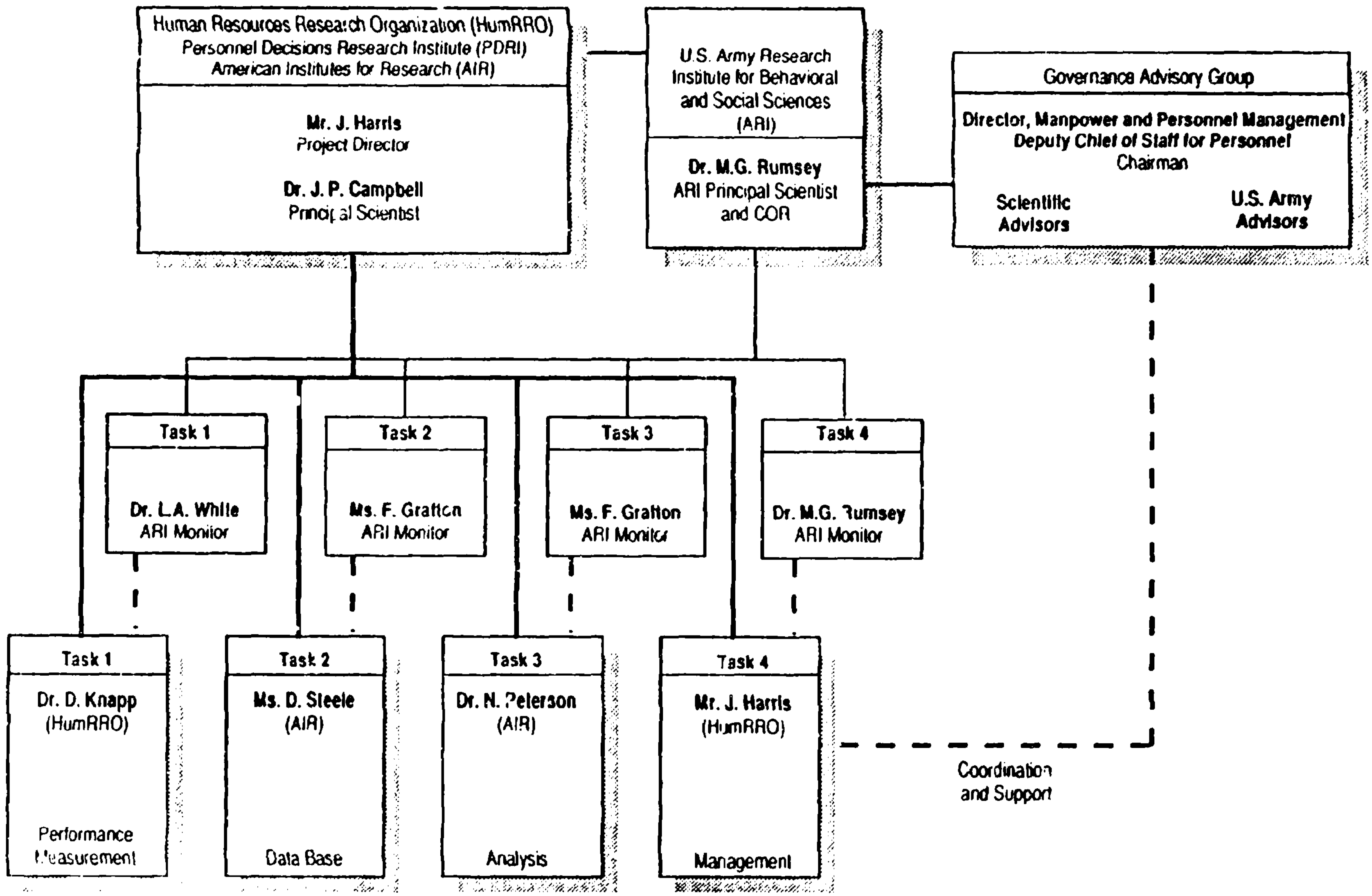

Figure 1.1. Building the Career Force: Project management structure.

Project Design

As will be explained in a later section of this chapter, the remaining chapters of this report all deal with analyses of data obtained at various points in the total project design. To set the stage for these discussions, as well as for the summary of work done during year one, the basic project design is summarized below.

The Research Sample

In general, the combined design for Project A/Career Force encompasses two major cohorts of soldiers (new accessions for 1983/84 and for 1986/87), each of which were followed into their second tour of duty and which collectively have produced six major research samples For each research sample there is a battery of predictor measures and an array of performance measures. For each of the six samples the predictor battery is composed of the ASVAB and either the Trial Battery or the Experimental Battery version of the new tests developed in Project A (see Campbell & Zook, 1991). There were three distinct arrays of performance measures corresponding to the need to assess (a) training performance, (b) first-tour job performance, and (c) second-tour job performance.

In each sample the individuals to be assessed were selected from two predetermined sets of MOS -- Batch A and Batch Z. They are listed in Figure 1.2. The two groups differed in that tests administered to Batch A MOS included MOS-specific rating scales and hands-on and job knowledge tests, whereas the only MOS-specific measure administered to the Batch Z MOS was an end-of-training test.

Batch A		Batch Z	
MOS		MOS	
11B	Infantryman	12B	Combat Engineer
13B	Cannon Crewman	16S	MANPADS Crewman
19E	M60 Armor Crewman	27E	Tow/Dragon Repairer
19K	M1 Armor Crewman	29E	Comm.-Electronics Radio Repairer
31C	Single Channel Radio Operator	51B	Carpentry/Masonry Specialist
63B	Light-Wheel Vehicle Mechanic	54B	NBC Specialist
71L	Administrative Specialist	55B	Ammunition Specialist
88M	Motor Transport Operator	67N	Utility Helicopter Repairer
91A	Medical Specialist	76Y	Unit Supply Specialist
95B	Military Police	94B	Food Service Specialist
		96B	Intelligence Analyst

Figure 1.2. Project A/Career Force Military Occupational Specialties (MOS)

The MOS in the two groups were carefully sampled to represent the variation in job content in the Army occupational structure. In addition, they were selected so as to overrepresent both the combat specialties and those MOS with the larger proportions of women and minority groups. The MOS selection procedure has been described in detail in previous Project A reports (e.g., Campbell, 1987).

A glossary of terms for the samples and for the different measurement batteries is given in Figure 1.3. The six major samples, their approximate size, and the predictor and/or performance batteries that were administered to each are shown in Figure 1.4.

Glossary of Terms

CVI Sample (CVI)	Soldiers who entered the Army between 1 Jul 83 - 30 Jun 84 <u>and</u> were in 1985 Project A Concurrent Validation. They were administered the Trial Predictor Battery and the first-tour job performance measures.
CVII Sample (CVII)	Soldiers who entered the Army between 1 Jul 83 - 30 Jun 84 <u>and</u> were in the 1985 Project A Concurrent Validation (CVI) <u>and</u> the 1988 Second-tour Concurrent Validation (CVII). They were administered the second-tour job performance measures and were re-administered the ABLE.
LV Sample (LV)	Soldiers in the Longitudinal Validation sample who entered the Army between 20 Aug 86 - 30 Nov 87 <u>and</u> were administered the Experimental Predictor Battery and End-of-Training measures.
LV Training Sample (LVT)	Soldiers in the Longitudinal Validation sample who finished AIT and who were administered the End-of-Training measures.
LVI Sample (LVI)	Soldiers who entered the Army between 20 Aug 86 - 30 Nov 87 <u>and</u> were in the LV Sample <u>and</u> the 1988 First- Tour Longitudinal Validation Sample. They were administered the first-tour job performance measures.
LVII Sample (LVII)	Soldiers who entered the Army between 20 Aug 86 - 30 Nov 87 <u>and</u> were in the LV Sample <u>and</u> the LVI Sample <u>and</u> who will be in the 1991 Longitudinal Validation (LVII). They were administered the second-tour job performance measures.

Figure 1.3. Glossary of terms for Project A/Career Force research samples.

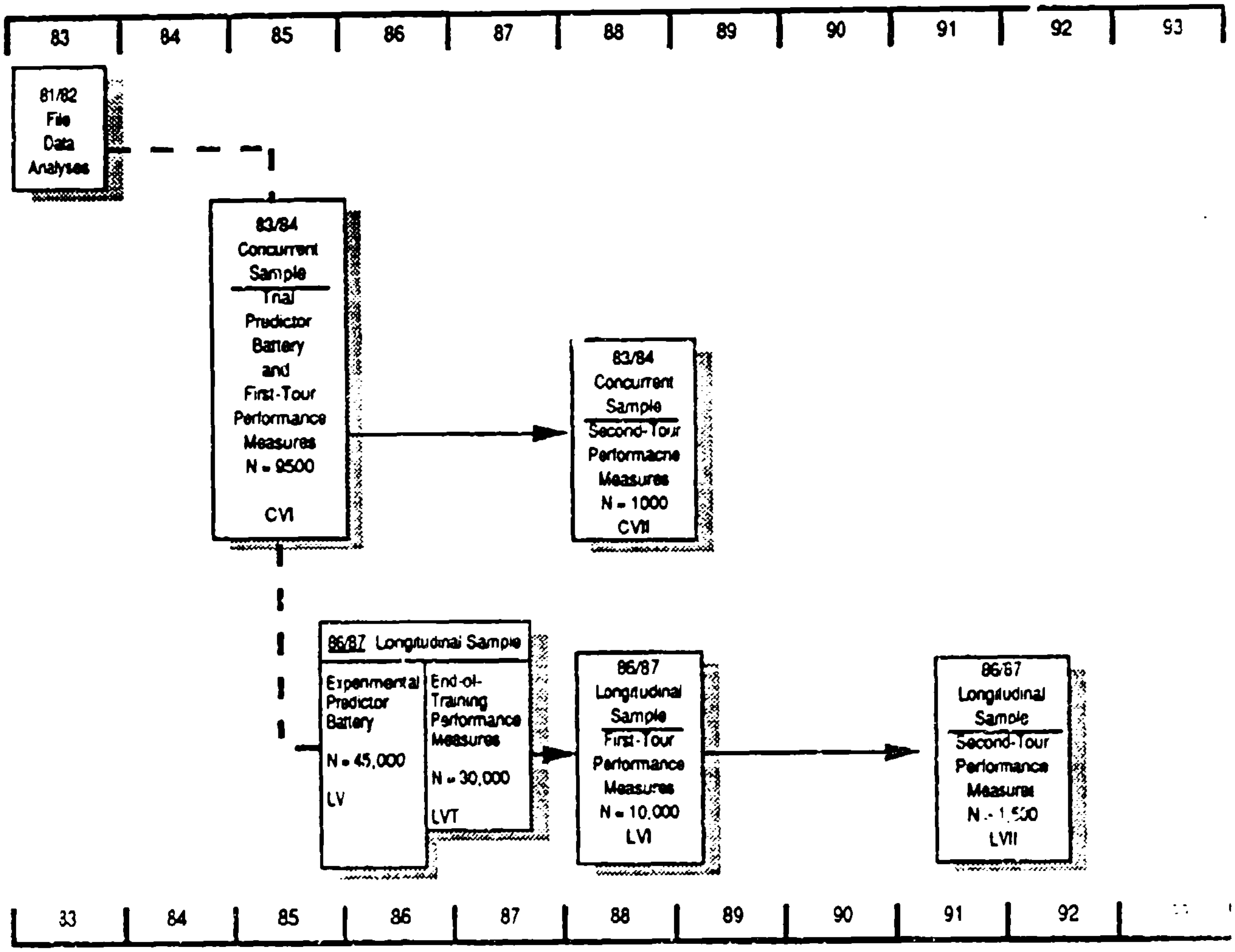

Figure 1.4. Career Force research flow and samples.

Procedure

The data collection procedures for each sample have been described in detail in previous reports (e.g., see Campbell & Zook, 1990). Each data collection involved on-site administration by a trained data collection team headed by a team leader from the contractor staff who worked closely with a designated Army point-of-contact (POC) at the site. A brief characterization of each of the six samples in terms of the timing, location, and duration (per soldier) of the data collection is given below.

<u>The Concurrent Validation (CVI) sample</u>. The data were collected at 13 posts in the continental United States and at two locations in Europe. Each individual was assessed for 1 1/2 days on the project-developed first-tour job performance measures and for 1/2 day on the new predictor measures (the Trial Battery). The individuals in the sample had been in the Army for 18-24 months. Data analysis has been completed for this sample.

The Longitudinal Validation (LV) Sample. All individuals were assessed on the 4-hour Experimental Predictor Battery within 2 days of first arriving at their assigned Reception Battalion where they would undergo Basic/Advanced Individual training. Data were collected over a 14-month period at eight Reception Battalions by a permanent, on-site data collection team.

The Longitudinal Validation End-of-Training Sample (LVT). The End-of-Training (EOT) performance measures were administered to those individuals in the LV sample who completed Advanced Individual Training (AIT), which could take from 2 months to 6 months, depending on the MOS. The training performance measures consisted of an MOS-specific training achievement test and a series of rating scales completed by peers and drill instructors. Data collection took place during the last three days of AIT.

The Longitudinal Performance Measurement (LVI) Sample. The individuals in the 86/87 cohort who were measured with the Experimental Predictor Battery, completed AIT, and remained in the Army were assessed with the full array of first-tour job performance measures when they were between 18 and 24 months of service. Data collections were conducted at 13 posts in the United States and two locations in Europe. The administration of the LVI first-tour criterion measures took one day per soldier.

The Concurrent Validation Second-Tour (CVII) Sample. The same data collection teams that administered the first-tour performance measures to the LVI sample also administered the second-tour performance measures at the same location and during the same time periods to a sample of junior NCOs from the 83/84 cohort in their second tour of duty (4-5 years of service). Every attempt was made to include second-tour personnel from the designated MOS who had been part of the first-tour Concurrent Validation sample (CVI). The CVII data collection took one day per soldier.

The Longitudinal Validation Second-Tour (LVII) Sample. The personnel in this sample are members of the 86/87 cohort from the designated MOS who were part of the LV (predictors and training performance measures) and LVI (first-tour job performance measures) samples and who reenlisted for a second tour of duty. The revised second-tour performance measures are being administered at 15 U.S. posts, two locations in Europe, and two locations in Korea. The LVII performance assessment takes one day per soldier.

Current Status

The LVII data collection is ongoing and will be completed during the summer of 1992. The content of this second-year annual report is based on analyses of data from the LV, LVI, and CVII samples.

ADMINISTRATIVE SUMMARY

The project advisory group meetings and In-Progress Reviews (IPR) during the first two years of the project are summarized in this section. The Scientific Advisory Group (SAG) and an Action Officers' Working Group met once each during this period. In addition, project staff members and sponsor representatives held two IPRs for Tasks 2 and 3.

Scientific Advisory Group

The purpose of the SAG meeting was to present the results of the following activities:

- Completion of the data entry and data editing necessary to produce appropriate data files for analyses of the Longitudinal Validation predictor data (LV predictors) collected during Project A; the longitudinal sample end-of-training (EOT) performance data collected during Project A; and the second-tour (NCO) performance data collected on the 83-84 cohort as part of the Project A Longitudinal Validation. This is the Concurrent Validation II (CVII) sample.

- The "basic scores" by which the information in the Experimental Predictor Battery, the EOT performance measures, and the CVII performance measures was represented.

- The modeling of the latent structure of the covariance matrices for each of the three sets of basic scores measuring performance.

During the meeting, little time was spent on the data quality analyses or basic item/scale statistics. The major part of the attention was devoted to discussions on the rationale for the basic scores in each domain and the subsequent analysis of their covariance structures and whether the subsequent modeling steps constituted a useful procedure.

The SAG endorsed the project's overall objectives but expressed caution that immediate Army problems and priorities not be overlooked. They emphasized that specific analysis plans should be linked, where possible, to relevant operational issues; however, concern for operational relevance should not be a basis for sacrificing scientific quality.

With respect to the analyses of second-tour measures, there was considerable discussion about both the analytic methods used and the results obtained. The SAG recommended that special attention be given to the problem of restricted range in the measures of second-tour performance. In particular, they were interested in comparisons between those who "made it" and those who did not. They also recommended separate analyses on combat and noncombat jobs.

The SAG has a strong interest in additional analyses focused on identifying more precisely what the Situational Judgment Test (SJT) is measuring. They also believe that SJT has a high potential as an operational tool and that such an implementation should be considered.

The SAG suggested that the distinction between leadership and technical skill/effort be more closely examined in the analyses of second-tour performance dimensions. The ratings method variance that is confounded with many of the reference variables for the leadership construct may have made it difficult for a unique leadership factor to emerge. Some further analyses were suggested for consideration. First, a close analysis of the residuals was thought to be useful. Second, an analysis with all indicators of leadership removed was suggested. Finally, there was a suggestion that a

small sample be drawn representing the distribution of combat and noncombat forces, and that separate analyses be run on this sample.

With respect to end-of-training analyses, the SAG expressed concern about the large number of ratees per rater in some instances. They advised further consideration of whether too many factors were identified in the analyses of the end-of-training data. They recommended that when the training measures are examined as predictors of future performance, multiple regression be conducted first with one general end-of-training factor, with the other factors added one-by-one. In this way, the incremental value of each additional factor can be determined.

Several recommendations were made regarding analyses of the predictor measures. SAG suggested that a complete theoretical foundation for the analyses concerning modeling of predictor measures be developed. They raised warnings. First, they cautioned project staff against ignoring factors that may seem small; careful attention should be given to extracting all relevant factors for the ABLE questionnaire (Assessment of Background and Life Experiences), for ASVAB, and for the spatial tests. SAG also cautioned against trying too vigorously to develop interest scales that balance gender differences.

Action Officers' Working Group

The Action Officers' Working Group is comprised of representatives from the major commands who were to support the 1991/92 second-tour data collection (LVII). The Group was established by ARI to reflect the need to involve the elements of the Army most directly concerned at critical points throughout the project--to get input and guidance on critical issues confronting the project so that these issues are resolved in a manner which best serves the interests of all involved.

The specific purpose of this meeting was to provide the Group with a general understanding of the project and its goals and solicit their thoughts and suggestions on (a) the general focus and direction of the project, (b) the manner in which NCO performance is to be measured in the project, (c) logistical issues associated with planned data collection activities, and (d) strategies for ensuring that the products developed are used for the maximum benefit of the Army.

The issues associated with the planned data collection were the focus of the meeting, particularly problems associated with getting sufficient sample sizes and recommendations for overcoming these obstacles.[1] Specifically, we were concerned that our troop support requests would be inaccurate due to difficulty in projecting future locations of target soldiers; that we would have difficulty getting individual soldiers to testing because soldiers were shifting locations and leaving the Army; that we would have limited access to soldiers on training or alert status, and no control over soldiers on annual, sick, or emergency leave; and that there were special difficulties testing target soldiers in USAREUR because soldiers are widely dispersed, few

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[1] It is important to note that the Action Officers' Working Group met 5 months before the events of Desert Shield/Desert Storm.

locations can support the equipment requirements, and taskings were done at the Corps level. Additional anticipated problems caused by projected downsizing in response to the current events in Eastern Europe included the geographical shifting of soldiers out of Germany, low reenlistment rates, and budget cuts.

The Group concurred with our plans to improve the sample sizes, including increasing the scope of testing by testing soldiers who have predictor data, first-tour data, or both; testing at additional sites (e.g., Fort Drum, Military District of Washington/Aberdeen Proving Ground, Korea); increasing the minimum sample size requirements for high density MOS (e.g., 11B, 13B, 91A). We also proposed to increase the testing efficiency by improving soldier tracking methods; seeking increased cooperation from military, to include flexibility on troop support requests, tasking at level of individual soldiers rather than at the unit level, and seeking more favorable resolutions of scheduling conflicts; and eliminating hands-on testing for some MOS where the sample sizes would be small and the equipment costs both high and burdensome.

In-Progress Reviews (IPR)

First IPR. Final recommendations for the experimental battery predictor composites were made; the development of a set of alternative composite scores for ABLE was summarized; the procedures for computing predictor composite scores, including the imputation process that was used, were described; the initial results for prediction of EOT criteria with Experimental Battery predictor composites, including the alternative ABLE composites, were reported; the development of the second-tour performance model was described, along with the initial results for predicting the elements of the model with ASVAB and ABLE scores; the initial data screening process was described for the longitudinal validity criterion data file, as was the status of ratings, administrative measures, school knowledge tests, job knowledge tests, hands-on tests, and data from the Multipurpose Arcade Combat Simulator (MACS). A representative from the Defense Manpower Data Center (DMDC), Personnel Testing Division described upcoming activities relevant to ASVAB updates and other revisions to Department of Defense testing/classification activities. A summary of the meeting follows.

<u>Use of prior methods</u>. Several discussions focused on methods of handling or analyzing data as it had been done during Project A. The analysis teams generally followed the procedures developed in earlier phases of the research program. The group agreed that this was the best way to proceed, making comparisons between current and prior analyses as meaningful as possible. It was agreed that where new methods are indicated by empirical findings from earlier or current project analyses or by advances in technique, then the new methods would be used and the reason for the change in method documented.

<u>Differences between "screened in" and "screened out" groups for the ABLE</u>. Concerns were expressed that the screening procedures might produce important differences between groups passing the screens and groups failing the screens. The groups should be compared on variables like race, gender, and ASVAB scores. The intent is not to change the screening procedures for

research purposes, but to be prepared to answer questions in the future, especially if implementation becomes an issue.

Sets of ABLE composite scores. End-of-training and second-tour performance validation analyses revealed very little difference between the three sets of ABLE composites. The view was expressed that achieving equal validities with two-thirds of the items weighs in on the side of the shorter version. However, the most telling evidence will come from the longitudinal design, and the group thought it best to await that evidence before making any decisions on the most useful set of composite scores.

Second-tour performance model. The recommended second-tour performance model contained six factors labeled as substantive and two labeled as method. A recommendation was made that we attempt to confirm a "five substantive and three method" factor model with the Simulation (role play) measures treated as a method factor.

Additional analyses for second-tour validation. Three specific types of additional analyses were suggested: (a) look at the Situational Judgment Test separately, (b) use ABLE composites separately, and (c) use a priori weights for the predictors (from the Synthetic Validity project (Wise et al., 1991) and Project A first-tour analyses).

Second IPR. The following topics were discussed: end-of-training validation results for LVI, CVII validation results, CVI and CVII relationships, LVI model confirmation and initial validation analyses, and an attrition analyses working group. A summary of each follows.

End-of-training validation results for LVI. The end-of-training validation results for the LVI sample were presented. There was some discussion about the meaning and/or explanation of the significant intercept differences in these analyses: Is this "good" or "bad"? What is the source of the difference(s)? Regression plots and criterion and predictor means and standard deviations could be examined to shed more light on the "cause" of the finding, but the implication will remain the same in any case--that separate intercepts should be used for each MOS. This seems to be "neutral," in that it is in line with current practice and does not appear to have any negative implications for the ASVAB or other predictors.

CVII validation results. A notation was made that some of the critical CVII analyses should be redone with MOS 11B (Infantryman) removed. This should make results for Core Technical Proficiency and General Soldiering Proficiency more consistent. Zero order correlations should be included with regression weights for the CVII hierarchical analyses, and better summary tables are needed for those analyses. The summary of the validity generalization analysis should show what happens when the predictors in the equation are held constant and only the weights vary (in contrast to allowing both the predictors and weights to vary). It was also noted that showing statistical significance tests for the incremental validities and for differences produced by using non-optimal weights would be desirable.

CVI and CVII relationships. Analyses were presented showing the relationship between CVI and CVII criterion scores and the incremental validities of the CVI criteria over the prediction achieved by the ASVAB and Trial Battery, as weighted by CVI least-squares weights. There was some

discussion of the nature of range restriction attributable to the reenlistment process. Many soldiers are declared ineligible who might, in fact, be eligible if they expressed a desire to reenlist. Furthermore, all requirements for eligibility can be waived at the local level. The murkiness of the process makes it difficult to decide how to correct range restriction for the CVI/CVII samples.

LVI model confirmation and initial validation analyses. The issue of using zero uniqueness values in the confirmatory model analyses was questioned and discussed. It was agreed that there was no satisfactory method of fixing or estimating the uniqueness estimates when they became negative if left free. It was decided that the model confirmation analyses would be rerun with 1 minus the squared multiple correlation as the uniqueness estimate, to see whether any appreciable differences occurred with this procedure, as compared to the use f zeroes.

There was considerable discussion of the different results obtained for the Effort and Leadership criterion in the LVI sample in contrast to the CVI sample. Basically, this criterion is better predicted by cognitive measures and less well predicted by ABLE measures in the LVI sample when compared to the CVI sample. This finding is complicated by some changes in the criterion construct itself and some changes in the makeup of the ABLE composites.

Attrition analyses working group. A working group was formed to work on attrition analyses. The group will examine the methods used by others to form criterion scores and conduct the analyses, as well as examining the use of survival analysis techniques.

SUMMARY OF SCIENTIFIC WORK FOR YEAR ONE

As described in the first annual report (Campbell & Zook, 1990), the objectives of the project's first year were focused on developing a full design for the data base and on analyzing basic scores for (a) the final version of the Experimental Predictor Battery (EB), (b) the End-of-Training (EOT) performance measures, and (c) the second-tour criterion measures used to assess NCO performance in the second-tour Concurrent Validation (CVII) sample. The data from the End-of-Training (EOT) and second-tour Concurrent Validation (CVII) performance assessment were also used to formulate both a model of training performance and a model of second-tour (junior NCO) job performance. That is, the basic scores from the individual performance measures were aggregated into factor scores that represented, as well as possible, the major components or latent structure, of training performance and second-tour job performance.

By the end of year one, the data collection for the Longitudinal Validation first-tour performance assessments had been completed, but the data cleaning and editing were still in progress and the analysis of the LVI performance measures had not yet begun.

Data Base Design

As described in the first-year annual report, the Career Force data base design allows access at any level of score aggregation. The report describes each variable and the amount of information that is available. The data are

stored at the NIH computing facility and are accessed via a secure system that requires prior approval by the Army.

The data base also includes data from the following operational files maintained by the Army:

- Applicant/Accessions Data
- Training Data
- Skill Qualification Test Data
- Enlisted Master Data Center Cohort Data
- World-Wide Locator Data

Continuous file updates are made only for the Enlisted Master File (EMF), which is updated on a quarterly basis for each individual in all Project A and Career Force Project cohorts.

We continue to believe that the entire data base will be an extremely valuable resource for Army personnel management for many years in the future.

Basic Scores for the Experimental Battery

During year one, much effort was devoted to analyzing the data that had been obtained by administering the Experimental Predictor Battery to approximately 50,000 new accessions in the Longitudinal Validation sample. A number of data editing procedures were compared and evaluated, and great care was taken to maximize data quality for the information that was entered into the final data file. The psychometric properties and subgroup differences for each measure were analyzed, and a series of exploratory and confirmatory analyses were conducted to identify the basic predictor scores within each domain that would be used in the validation analyses.

The final array of tests in the Experimental Battery and the constructs they are intended to measure are shown in Figure 1.5. The 31 basic scores that are obtained from the specific test indicators are shown in Figure 1.6 (Campbell & Zook, 1990).

There was a very high degree of consistency between the Concurrent Validation and the Longitudinal Validation in terms of the factor structures of the various measures. The resulting definitions of the basic predictor scores to be used in the validation analyses were quite similar.

Basic Scores for the End-of-Training Measures

During year one, the data from the School Knowledge Test and the seven training performance rating scales were analyzed in terms of their psychometric properties and factor structure. Confirmatory techniques were used to identify the "model" of training performance that best represented the covariances among the observed measures. That is, an a priori set of alternative models was proposed and evaluated in terms of the degree to which they fit the data. In the end six basic scores were proposed, two based on the knowledge test and four based on the rating scales. A brief characterization of the six scores is given in Figure 1-7.

Test/Measure	Construct
Paper-and-Pencil Spatial Tests	
Assembling Objects	Spatial Visualization-Rotation
Object Rotation	Spatial Visualization-Rotation
Maze	Spatial Visualization-Scanning
Orientation	Spatial Orientation
Map	Spatial Orientation
Reasoning	Induction
Computer-Administered Tests	
Simple Reaction Time	Reaction Time (Processing Efficiency)
Choice Reaction Time	Reaction Time (Processing Efficiency)
Short-Term Memory	Short-Term Memory
Perceptual Speed and Accuracy	Perceptual Speed and Accuracy
Target Identification	Perceptual Speed and Accuracy
Target Tracking 1	Psychomotor Precision
Target Shoot	Psychomotor Precision
Target Tracking 2	Multilimb Coordination
Number Memory	Number Operations
Cannon Shoot	Movement Judgment
Temperament, Interest, and Job Preference Measures	
Assessment of Background and Life Experiences (ABLE)	Adjustment
	Dependability
	Achievement
	Physical Condition
	Leadership (Potency)
	Locus of Control
	Agreeableness/Likability
Army Vocational Interest Career Examination (AVOICE)	Realistic Interest
	Conventional Interest
	Social Interest
	Investigative Interest
	Enterprising Interest
	Artistic Interest
Job Orientation Blank (JOB)	Job Security
	Serving Others
	Autonomy
	Routine Work
	Ambition/Achievement

Figure 1.5. Experimental predictor battery tests and relevant constructs.

ASVAB Factor Composites

- Quantitative
  - Mathematics Knowledge
  - Arithmetic Reasoning
- Technical
  - Auto/Shop Information
  - Mechanical Comprehension
  - Electronics Information
- Speed
  - Coding Speed
  - Number Operations
- Verbal
  - Word Knowledge
  - Paragraph Comprehension
  - General Science

Paper-and-Pencil Test Composite

- Spatial
  - Assembling Objects Test
  - Object Rotation Test
  - Maze Test
  - Orientation Test
  - Map Test
  - Reasoning Test

Computer-Administered Test Composites*

- Psychomotor
  - Target Tracking 1 Distance
  - Target Tracking 2 Distance
  - Cannon Shoot Time Score
  - Target Shoot Distance
- Movement Time
  - Pooled Movement Time
- Perceptual Speed
  - Perceptual Speed & Accuracy (DT)
  - Target Identification (DT)
- Basic Speed
  - Simple Reaction Time (DT)
  - Choice Reaction Time (DT)
- Perceptual Accuracy
  - Perceptual Speed & Accuracy (PC)
  - Target Identification (PC)
- Basic Accuracy
  - Simple Reaction Time (PC)
  - Choice Reaction Time (PC)
- Number Speed and Accuracy
  - Number Memory (Operation DT)
  - Number Memory (PC)
- Short-Term Memory
  - Short-Term Memory (PC)
  - Short-Term Memory (DT)

ABLE Composites

- Achievement Orientation
  - Self-Esteem
  - Work Orientation
  - Energy Level
- Leadership Potential
  - Dominance
- Dependability
  - Traditional Values
  - Conscientiousness
  - Nondelinquency
- Adjustment
  - Emotional Stability
- Cooperativeness
  - Cooperativeness
- Internal Control
  - Internal Control
- Physical Condition
  - Physical Condition

JOB Composites

- High Job Expectations
  - Pride
  - Job Security
  - Serving Others
  - Ambition
- Job Routine
  - Routine
- Job Autonomy
  - Autonomy

AVOICE Composites

- Rugged/Outdoors
  - Combat
  - Rugged Individualism
  - Firearms Enthusiast
- Audiovisual Arts
  - Drafting
  - Audiographics
  - Aesthetics
- Interpersonal
  - Medical Services
  - Leadership/Guidance
- Skilled/Technical
  - Science/Chemical
  - Computers
  - Mathematics
  - Electronic Communication
- Administrative
  - Clerical/Administrative
  - Warehousing/Shipping
- Food Service
  - Food Service - Professional
  - Food Service - Employee
- Protective Services
  - Fire Protection
  - Law Enforcement
- Structural/Machines
  - Mechanics
  - Heavy Construction
  - Electronics
  - Vehicle Operator

*DT = Decision Time and PC = Proportion Correct

Figure 1.6. Longitudinal Validation Experimental Battery: Composite scores and constituent basic scores.

EOT RATING SCALE BASED SCORES

1) **EFFORT AND TECHNICAL SKILL (ETS)**

Technical Knowledge/Skill:	How effective is each soldier in acquiring job/soldiering knowledge and skill?
Effort:	How effective is each soldier in displaying extra effort?

2) **Maintaining Personal Discipline (MPD)**

Following Regulations and Orders:	How effective is each soldier in adhering to regulations, orders, and SOP and displaying respect for superiors?
Self Control:	How effective is each soldier in controlling own behavior related to aggressive acts?

3) **Physical Fitness and Military Bearing (PFB)**

Military Appearance:	How effective is each soldier in maintaining proper military appearance?
Physical Fitness:	How effective is each soldier in maintaining military standards of physical fitness?

4) **Leadership Potential (LEAD):**

Leadership Potential:	Evaluate each soldier on his or her potential effectiveness as a leader. Do not necessarily rate on the basis of present performance.

EOT KNOWLEDGE TEST BASED SCORES

5) **Basic Knowledge Score:**	Items measuring knowledge requirements common to all MOS.
6) **Technical Knowledge Score:**	Items measuring technical knowledge requirements specific to each MOS.

Figure 1.7. Composite scores that reflect End-of-Training performance factors.

These six scores will serve both as criterion measures (for the Experimental Battery) and as predictors (of first-tour and second-tour job performance) in later validation analyses.

Development of Second-Tour Performance Scores (CVII)

The performance measures used in the CVII, and their development, have been described in detail in previous reports (Campbell, 1991; Campbell & Zook, 1991). First-tour measures were revised for use with second-tour personnel and new measures reflecting the unique components of second-tour jobs were added. A summary description of the specific measures is given below.

Rating Scales

On the basis of second-tour critical incident analyses, the Army-wide Behaviorally Anchored Ratings Scales (BARS) and MOS-specific BARS were revised and scales having to do with leadership and supervision were added. Further, based on job analysis data, seven new scales pertaining to supervision and leadership responsibilities were also added. A full list of the Army-wide rating scales is shown below. Not shown are the MOS BARS for each MOS, which were revised to reflect second-tour performance demands, and the Combat Prediction Scales, which were retained in the same form they were used in LVI, but which were not administered to female NCOs.

Army-Wide Behavior Scales (CVII):

1. Demonstrating Technical Knowledge and Skill
2. Demonstrating Effort
3. Supervising Subordinates
4. Following Regulations and Orders
5. Demonstrating Integrity
6. Training and Development of Subordinates
7. Maintaining Equipment
8. Physical Fitness
9. Self-Development
10. Showing Consideration for Subordinates
11. Demonstrating Appropriate Military Bearing
12. Demonstrating Appropriate Self-Control

Additional Leadership Scales (CVII):

13. Serving as a Role Model
14. Communication with Subordinates
15. Personal Counseling
16. Monitoring Subordinate Performance
17. Organizing Missions/Operations
18. Personnel Administration
19. Performance Counseling

General Scales:

20. Overall Effectiveness
21. Senior NCO Potential

Situational Judgment Test

A new paper-and-pencil measure of supervisory judgment was developed by describing prototypical judgment situations and asking the respondent to select the most appropriate and the least appropriate course of action. The situation descriptions and the scoring keys were refined through extensive subject matter expert (SME) judgments.

Supervisory Simulation Exercise

These measures were developed to assess NCO performance in job areas that were judged to be best assessed through the use of interactive exercises. The simulations were designed to evaluate performance in counseling and training subordinates. A trained evaluator (role player) played the part of a subordinate to be counseled or trained and the examinee assumed the role of a first-line supervisor who was to conduct the counseling or training. Evaluators also scored the examinee's performance, using a standard set of rating scales.

Here are brief descriptions of the three simulation exercises:

- **Personal Counseling Simulation**: A PFC is exhibiting declining job performance and personal appearance. Recently, the PFC's wall locker was left unsecured. The supervisor has decided to counsel the PFC about these matters.

- **Disciplinary Counseling Simulation**: There is convincing evidence that the PFC lied to get out of coming to work today. The PFC has arrived late to work on several occasions and has been counseled for lying in the past. The PFC has been instructed to report to the supervisor's office immediately.

- **Training Simulation**: The commander will be observing the unit practice formation in 30 minutes. The private, although highly motivated, is experiencing problems with the hand salute and about face.

For each exercise, examinee performance was evaluated on 3-point rating scales reflecting specific behaviors tapped by the exercises and a 5-point overall effectiveness rating scale.

Factor analyses of the ratings data suggested that each simulation could be scored in terms of the content of the NCO's behavior (i.e., did he or she do or say the right things) and the process, or style, with which the counseling steps were carried out.

Administrative Measure

The self-report Personnel File Form (PFF) used in LVI was modified slightly for use with second tour and six administrative indices were obtained.

Job Knowledge and Hands-On Measures

The content of each of these measures was revised on the basis of the second-tour job analyses and the revised instruments were subjected to extensive SME review. Comprehensive analyses of alternative aggregations of item and scale scores from both of these measures resulted in the adoption of a basic (Army-wide) and technical (MOS-specific) score for each of them.

Final Array of Second-Tour Basic Performance Scores

After extensive analyses of their psychometric properties and factor structures, based on CVII data, the final array of basic second-tour performance scores was as shown in Figure 1.8. There were 22 basic scores. It is this array of scores that became the basis for the second-tour performance modeling analysis.

Development of Second-Tour Performance Model

The basic CVII performance scores served as input to the development of a latent structure model for second-tour performance. Based on a consensus of the project staff, three major alternatives could be used to explain the observed correlations. Consequently, the competing models that were evaluated for comparative goodness of fit, using the LISREL VI program (Joreskog & Sorbom, 1986), were the following.

(1) First-Tour Model: Includes five substantive and two methods factors, with the SJT and Simulation variables all loading on the Effort and Leadership factor.

(2) Leadership Factor Model: Includes a sixth substantive factor with the SJT, Simulation, and Leadership Rating factor variables all loading on this factor. This model was evaluated with and without a separate Role-Play "methods" factor.

(3) Training and Counseling Factor Model: Includes a sixth substantive factor with just the Simulation variables. No separate Role-Play methods factor could be estimated under this model.

Of the three models, the Training and Counseling Factor Model provided the closest fit to the observed data. The Simulation exercise scores showed a good deal of internal consistency, but had very low correlations with any of the other performance measures. Consequently, any model that included a factor with loadings for both Simulation variables and other performance variables did not provide a reasonable fit to the data (as either the consistency among the Simulation exercises was underestimated or their correlations with other measures were overestimated). A result of considerable interest was that the SJT (a paper-and-pencil measure) fit best with the Effort and Leadership factor, in spite of the method variance involved.

The basic scores that have been used to represent the latent variables are as shown in Figure 1.9. For validation analysis purposes, the six substantive factor scores are obtained by standardizing and summing the basic scores within each factor.

Hands-On Job Sample Test

1. MOS-specific task performance score
2. Common task performance score

Job Knowledge Test

3. MOS-specific task knowledge score
4. Common task knowledge score

Army-Wide Rating Scales

5. Leadership/supervision composite
6. Technical proficiency and effort composite
7. Maintaining personal discipline composite
8. Physical fitness and military bearing composite

MOS-Specific BARS Scales

9. One overall MOS BARS composite score

Combat Performance Prediction Scales

10. One overall combat scale composite

Personnel File Form

11. Awards and Commendations
12. Articles 15/Flag Actions
13. Physical Qualification
14. M16 Qualification
15. Number of Military Training Courses
16. Promotion Rate

Situational Judgment Test

17. One score obtained by subtracting the total "ineffectiveness" score from the total "effectiveness" score

Supervisory Simulation Exercises

18. Personal Performance Counseling: Interaction Process
19. Personal Performance Counseling: Interaction Content
20. Discipline Problem Counseling: Interaction Process
21. Discipline Problem Counseling: Interaction Content
22. One-on-One Training: Total Composite Score

Figure 1.8. Summary list of second-tour basic criterion scores.

Latent Variables in the CVII Performance Model

- **Core Technical Proficiency (CTP)**
  - Job-Specific Hands-On
  - Job-Specific Knowledge

- **General Soldiering Proficiency (GSP)**
  - Common Hands-On
  - Common Job Knowledge

- **Effort and Leadership (ELS)**
  - Awards and Certificates
  - Training Courses
  - Grade Deviation Score
  - Army-Wide BARS Leadership Rating
  - Army-Wide BARS Technical Rating
  - MOS BARS Average Rating
  - Situational Judgment Test

- **Personal Discipline (MPD)**
  - Articles 15, Flag Actions (reversed)
  - Army-Wide BARS Discipline Rating

- **Physical Fitness/Military Bearing (PFB)**
  - Physical Readiness Score
  - Army-Wide BARS Fitness/Bearing Rating

- **Training and Counseling Subordinates (TCS)**
  - Simulation Exercise - Personal Counseling Content
  - Simulation Exercise - Personal Counseling Process
  - Simulation Exercise - Disciplining Content
  - Simulation Exercise - Disciplining Process
  - Simulation Exercise - Training

- **Written Methods (WM)**
  - Job-Specific Knowledge
  - Common Soldiering Knowledge
  - Situational Judgment Test

- **Ratings Methods (RM)**
  - Four Army-Wide BARS Dimensions
  - MOS BARS Average

Figure 1.9. Relationship of specific variables to overall factors in the CVII performance model.

PROJECT EFFORTS FOR YEAR TWO

The remainder of this report describes the work that was done during the second year of the Career Force Project. Year two was a period of score

development, model building, and basic validation analyses for (a) training performance (EOT), (b) first-tour performance (LVI), and (c) second-tour performance (CVII).

During year two the second-tour longitudinal data collection (LVII) began and is currently ongoing. The nature of the LVII data file will be described in the annual report for year three.

Objectives

The specific objectives for the second-year annual report are as follows.

(1) Describe the basic validation analyses for the prediction of performance in training. Last year's annual report (Campbell & Zook, 1990) described the development of the end-of-training performance scores. These six scores are the criteria against which the Experimental Predictor Battery was validated.

(2) Describe the development of basic scores for the longitudinal sample first-tour performance measures. The nature of the LVI sample was described in last year's report. The basis for developing the LVI basic performance score was the parallel analysis for CVI, which was described in the Project A annual report for 1987 (Campbell, 1989).

(3) Describe the replication/confirmation of the first-tour performance model and the basic Longitudinal Validation analyses for the Experimental Predictor Battery against first-tour performance. These analyses use the LVI sample, which was described in the annual report for year one. The development of the final basic scores for the Experimental Predictor Battery was also described in last year's report. Included in this year's work was a special set of analyses that focused on developing a new set of factor-analytic-based scores for the ABLE.

(4) Describe the basic validation analyses for the prediction of second-tour performance, using the CVII sample. The parameters of the second-tour Concurrent Validation sample have also been described previously. For most of the sample, the available predictors were limited to the ASVAB scores obtainable from the permanent file and the ABLE which was given concurrently to approximately one-half of the total sample. Consequently, the CVII validation analyses must be regarded as a prototype for the LVII sample, which will have larger Ns and a more complete predictor set.

(5) Report the results of a preliminary analysis of the prediction of second-tour performance from first-tour predictors and performance. This more complete data set was available only for a very small subsample of soldiers from the CVI sample who were also assessed on the CVII second-tour performance measures.

Organization of This Report

Chapter 2 is an extension of the analysis of the LV Experimental Predictor Battery scores. It deals specifically with the development of two alternative sets of factor scores for the ABLE, thus producing three alternative scoring procedures, which will be evaluated in subsequent chapters. This ABLE composite score development was carried out by Dr. Leonard White and his colleagues at the Army Research Institute.

Chapters 3 through 9 deal with various aspects of the basic predictor validation analyses and move sequentially from the prediction of training performance to first-tour job performance to second-tour performance.

Chapter 3 presents the basic validation analyses for the prediction of end-of-training performance, using ASVAB and the LV Experimental Predictor Battery.

Chapter 4 describes the development of the basic scores for first-tour job performance based on the data from the performance assessments conducted in the LVI sample. Chapter 5 then reports the data editing and missing data imputation procedures that were used to produce a final data file for the LVI performance measures. Using these completed files, the next step was to conduct confirmatory analyses, reported in Chapter 6, to assess the goodness of fit of the Concurrent Validation (CVI) performance model to the Longitudinal Validation data, as against alternatives.

Chapter 7 then presents the results of the validation of the LV Experimental Predictor Battery against the basic LVI performance factors identified in Chapter 6. Both the content of the performance factors and the predictive validities were quite consistent from CVI to LVI.

Chapter 8 describes the validation results for predicting second-tour performance, using ASVAB and ABLE as predictors. The limitations of the sample and available predictors prevented a complete analysis of the validity of the Experimental Battery for predicting second-tour performance, but the results are significant and very encouraging.

Finally, Chapter 9 discusses a preliminary analysis, on a very small sample, of the validity of (a) the LV Experimental Battery, (b) end-of-training performance, and (c) first-tour performance for predicting second-tour performance. Even though the number of people who had complete data on all predictors was very small, the level of validity and the degree of convergent and discriminate validity were substantial.

In sum, the Career Force Project Second Year Annual Report describes a sequence of analyses based on four different samples: (a) the Longitudinal Validation predictor sample (LV), (b) the Longitudinal Validation End-of-Training Sample (LVT), (c) the Longitudinal Validation first-tour performance measurement sample (LVI), and (d) the Concurrent Validation second-tour performance measurement sample (CVII). The basic parameters of these samples are as described above. More detailed descriptions of specific sample sizes and measures are given in the appropriate chapters. Chapter 10 provides a brief summary of the project's second year and describes plans for future research activities.

Chapter 2
DEVELOPMENT OF COMPOSITE SCORES FOR ASSESSMENT OF THE BACKGROUND AND LIFE EXPERIENCES (ABLE) INSTRUMENT

Leonard A. White

This chapter describes the composite scores developed for the ABLE administered in the Longitudinal Validation (LV). Combining ABLE content scales into a smaller number of interpretable composites has practical advantages. ABLE composites can predict job performance with a more manageable number of test scores. Also, such composites can provide more reliable measures of underlying constructs.

ABLE RATIONAL SCALES AND COMPOSITES

At the beginning of development of the ABLE instrument in 1982, psychologists regarded temperament measures as poor predictors of job performance (e.g., Guion & Gottier, 1965), and there was no prevailing taxonomy of temperament constructs. However, some researchers argued that personality was described by five dimensions of temperament, known as the Big Five (Norman, 1963; Goldberg, 1981). The Big Five are Emotional Stability, Agreeableness, Conscientiousness, Intellectance, and Surgency. Later, Hogan (1982) distinguished a Sociability component of Surgency, yielding a total of six temperament dimensions.

Using Hogan's six dimensions as a starting point for a taxonomic analysis, Project A staff reviewed 146 temperament measures and sorted them into construct categories. Eighty percent of the scales matched one of the six constructs proposed by Hogan. The remaining 20 percent of the scales fit into categories of Achievement, Masculinity, and Locus of Control (see Kamp & Hough, 1988 for details on the development of this taxonomy). To determine relationships between these temperament constructs and job performance, Project A researchers reviewed 237 criterion-related validity studies conducted between 1960 and 1984. Results showed that temperament constructs predict multiple components of job performance and training success (Hough, Eaton, Dunnette, Kamp, & McCloy, 1990).

Based on the results of this literature review, 10 temperament scales were developed to form ABLE. These constructs were selected as the most promising for predicting performance in U.S. Army enlisted occupational specialties. In addition, four validity scales were added to detect inaccuracies in self-reports of temperament; for example, the Unlikely Virtues scale detects social desirability response bias (i.e., "faking good"). A self-report measure of physical condition was also included on ABLE (see Hough et al., 1990, for more information on the development of ABLE).

Project A staff wrote items for each target construct that sampled behaviors, beliefs, and attitudes thought to indicate the underlying trait in the applicant population. They also assigned items to specific scales prior to data analyses. Subsequent item screening involved assessing the gender/race sensitivity and psychometric characteristics of each item. Thus, ABLE is primarily a rationally derived measure, but has been modified somewhat using homogeneous scaling methods. Table 2.1 presents descriptive statistics for LV cases having complete ABLE data (screened for random responding).

Table 2.1

ABLE Scale Statistics for Longitudinal Validation Sample

Scale	No. of Items	Mean	SD	Coefficient Alpha
Content Scales				
Self-Esteem	12	28.8	4.00	.79
Work Orientation	19	45.3	6.25	.87
Energy Level	21	50.6	6.12	.85
Dominance	12	27.3	4.69	.84
Traditional Values	11	29.1	2.92	.64
Conscientiousness	15	36.7	4.15	.73
Nondelinquency	20	47.8	5.59	.79
Emotional Stability	17	40.2	5.62	.84
Cooperativeness	18	44.5	4.98	.81
Internal Control	16	41.9	4.42	.77
Physical Condition	6	13.5	3.04	.82
Validity Scales				
Nonrandom Response[a]	8	7.4	1.23	--
Unlikely Virtues	11	16.8	3.38	.63
Poor Impression	23	1.2	1.66	.64
Self-Knowledge	11	26.3	3.18	.61

Note. N = 39,904 unless noted otherwise.

[a]Data (N = 48,378) were not screened for random responding.

To develop ABLE rational composites, Peterson et al. (1992) performed exploratory and confirmatory (LISREL) factor analyses on the correlations among the content scale scores. The best fitting confirmatory model contained six factors. In this model, Dominance clustered with Self-Esteem, Energy Level, and Work Orientation, but was later retained as a separate construct because of its unique potential for predicting leadership.

The resulting seven temperament constructs and associated ABLE scales are shown in Table 2.2. The constructs of Dependability, Dominance (Surgency), Adjustment, and Cooperativeness have counterparts in the Big Five. Conversely, Achievement and Internal Control are not in the Big Five taxonomy, but were among the strongest predictors of job performance in the Project A review of the temperament domain (see Hough, 1992 for more details on the relationship of ABLE constructs to the Big Five).

Table 2.2

ABLE Rational Composites and Corresponding Content Scales

Composite	Scale
Achievement Orientation	Self-Esteem Work Orientation Energy Level
Leadership Potential	Dominance
Dependability	Traditional Values Conscientiousness Nondelinquency
Adjustment	Emotional Stability
Cooperativeness	Cooperativeness
Internal Control	Internal Control
Physical Condition	Physical Condition

DEVELOPMENT OF ABLE FACTOR COMPOSITES

Overview and Hypothesis

There are several methods of scale construction that can be used in developing omnibus personality inventories (Hase & Goldberg, 1967). As noted above, a rational/theoretical approach was the primary method used in developing ABLE. An alternative procedure is an empirical method of scale construction that emphasizes the internal variance structure of a set of items. Proponents of this method stress the importance of homogeneous scales. The scale development approach yielding the highest criterion-related validity would probably be preferred. However, little research is available comparing the validity of scales developed using these different methods.

Peterson et al. (1992) had formed the rational composites by combining ABLE content scales into meaningful, but not necessarily homogenous, clusters; all items within each content scale were assigned to the same construct. For the alternative procedure, it was hypothesized that the homogeneity of ABLE composites would increase if we allowed items from any given content scale to be keyed for different constructs. For example, we expected that Energy Level items pertaining to chronic fatigue would correlate highest with Emotional Stability, while those relating to energy in the workplace would cluster with Work Orientation items (Taylor, 1953; White, Nord, Mael, & Young, in press). In addition, Conscientiousness items were expected to cluster with the Achievement and Dependability constructs.

ABLE Factor Composites

Internal scale construction methods were used to increase, through homogeneous keying, the internal consistency of ABLE composites and to decrease their intercorrelations. First, we performed a principal factor analysis with varimax rotation on the 199 ABLE items in a sample of 39,904 recruits from the LV. Eleven factors were extracted using an eigenvalue-greater-than-one rule. (Several solutions with more than 11 factors were run but did not yield additional meaningful factors.) Our examination of the 11-factor solution revealed nine interpretable factors that accounted for 65 percent of the variance.

The first seven rotated factors from the item-level analyses roughly corresponded to the constructs in Table 2.2. Leadership Potential and Achievement emerged as separate factors in the analyses of ABLE item data. As noted earlier, in the factor analyses of ABLE scales, the Dominance and Achievement scales (e.g., Work Orientation) loaded on the same factor, but were placed on separate constructs.

Unlikely Virtues and Self-Knowledge comprised the remaining two interpretable factors. We had included items from the validity scales to test the hypothesis that the validity and content scale items would cluster on distinct factors. Note that it was beyond the scope of these analyses to modify the validity scales.

Results from the item factor analyses were used to form seven preliminary composites. These composites contained 97 items from ABLE content scales and the two unique items from Poor Impression that clustered with Adjustment. Each of the 99 items had high, distinctive loadings (.34 or above) on one factor and was assigned to one of the seven temperament composites. Next, correlations between the remaining 70 items and the preliminary factor composites were examined. We then assigned each of these items to the composite with which it had the highest correlation. One Traditional Values item was dropped because of its low correlation with all the factor composites. When the highest item-scale correlations were nearly equal, the item content was examined to determine the scoring. The seven factor composites resulting from this procedure used 168 items and will be called the ABLE-168 composites. In all, 125 items (74%) were assigned in the same way on the ABLE-168 and rational composites.

The item-scale correlations and factor loadings for items on ABLE-168 were varied, and some items did not improve the internal consistency of the composite for which they were keyed. Therefore, we developed a second set of composites by applying more stringent criteria for homogeneous scoring than was used for the ABLE-168.

For this second set of factor composites, we retained an item only if it correlated at least .33 with the scale for which it was assigned and had a higher correlation with its own composite (by .03) than any other. In addition, several items that added only minimally to internal consistency were dropped. Using these decision rules, 54 items (32% of the 168) were omitted in an iterative fashion based on discriminant validity and their contribution to internal consistency. The resulting set of composites had a total of 114 items and will be called ABLE-114 composites. Eighty-nine of these items were assigned in the same way on ABLE-114 and the rational composites.

Results and Discussion

The three scoring methods converged to yield seven similar temperament constructs. The composites measuring the same constructs were very highly correlated, with r = .88 to 1.0. For each of the scoring methods, Table 2.3 shows the correlations among the composites and Unlikely Virtues. Coefficient alpha reliabilities appear in the main diagonal. These reliability estimates were nearly identical for the three sets of composites, ranging from a median r = .83 to .85.

Table 2.3

Correlations Among Alternative ABLE Composites and Unlikely Virtues

ABLE Rational Composites

Composite	No. of Items	1	2	3	4	5	6	7
1. Achievement	52	(.93)						
2. Leadership Potential	12	.68	(.84)					
3. Dependability	46	.64	.38	(.88)				
4. Adjustment	17	.71	.54	.45	(.84)			
5. Cooperativeness	18	.61	.41	.63	.55	(.81)		
6. Internal Control	16	.58	.37	.56	.48	.49	(.77)	
7. Physical Condition	6	.50	.37	.24	.36	.24	.21	(.82)
8. Unlikely Virtues	11	.39	.22	.44	.28	.37	.19	.16

ABLE-168 Factor-Based Composites

Composite	No. of Items	1	2	3	4	5	6	7
1. Achievement	42	(.92)						
2. Leadership Potential	23	.70	(.89)					
3. Dependability	33	.58	.34	(.85)				
4. Adjustment	29	.68	.67	.44	(.89)			
5. Cooperativeness	16	.61	.49	.56	.58	(.80)		
6. Internal Control	17	.53	.35	.48	.44	.44	(.78)	
7. Physical Condition	8	.47	.50	.20	.46	.28	.19	(.83)
8. Unlikely Virtues	11	.44	.25	.44	.30	.36	.21	.17

ABLE-114 Factor-Based Composites

Composite	No. of Items	1	2	3	4	5	6	7
1. Achievement	28	(.91)						
2. Leadership Potential	19	.66	(.88)					
3. Dependability	21	.45	.24	(.82)				
4. Adjustment	15	.53	.52	.36	(.84)			
5. Cooperativeness	10	.46	.35	.48	.41	(.75)		
6. Internal Control	13	.52	.33	.45	.39	.37	(.78)	
7. Physical Condition	8	.47	.48	.15		.22	.20	(.83)
8. Unlikely Virtues	11	.42	.23	.39	[illegible]	.31	.21	.17

N = 39,904. $p < .001$ for all correlations. Coefficient alpha reliabilities are shown in parentheses.

Thus, the internal consistency of the shorter ABLE-114 composites was apparently maintained by selecting the most homogeneous items. As shown in Table 2.3, ABLE-114 composites had greater discriminant validity than both the ABLE-168 factor composites and the rational composites. The average correlation among the composites (off-diagonal elements) was r =.40 for ABLE-114, and r = .47 for the rational composites and ABLE-168. Also, the three sets of ABLE composites had similar levels of correlation with the Unlikely Virtues scale, with mean r = .28 to .31.

Table 2.4 shows the distribution of items on ABLE-168 and ABLE-114 for each of the ABLE content scales. The shaded areas in the table mark the scales used to measure the rational composites. Those items appearing in the shaded areas are common to both the rational and the factor composites, with ABLE-114 items shown in parentheses. Items outside the shaded areas were assigned differently on the rational and factor composites. For example, the 21 Energy Level items were assigned to Achievement on the rational composites, but only 13 of these items were assigned to Achievement on ABLE-168, and six were scored for Achievement on ABLE-114. On the factor composites, the remaining Energy Level items were used to measure Adjustment and Physical Condition.

As shown in Table 2.4, there is much overlap between the rational and factor composites. However, approximately 25 percent of item assignments for the factor composites were different from those used for the rational composites. Most of these are consistent with results from previous research and/or can be understood on the basis of item content.

For example, the Energy Level scale measures the degree of energy and enthusiasm a person has, as characterized by not tiring easily, taking few breaks, and being eager, optimistic, and excited (Hough et al., 1990). Items pertaining to energy and vigor in the workplace loaded with Work Orientation and were used to measure Achievement. Those indicating general lethargy, without specific reference to work, aligned with Adjustment.

Similarly, Conscientiousness items relating to meeting deadlines and showing responsibility at work loaded on the Achievement composite. Conscientiousness items tapping general responsibility and organization, but not specific to the workplace, were more likely to cluster on Dependability. The item analyses also showed a close correspondence between self-confidence in one's ability (i.e., Self-Esteem) and a reported willingness to lead (i.e., Dominance). This finding is consistent with previous work on the relationships between Dominance, Self-Esteem, and other measures (Hamilton, 1971).

In sum, we developed alternative ABLE composites measuring seven temperament constructs. The 114-item form is shorter and has higher discriminant validity than the other two sets of composites, with little apparent loss of reliability. Future research in the Career Force Project will examine the criterion-related validities of these alternative sets of composites.

Table 2.4

Distribution of ABLE Scale Items on ABLE-168 and ABLE-114 Factor Composites

ABLE Scale	No. of Items	ABLE Factor Composite						
		Achievement Orientation	Leadership Potential	Dependability	Adjustment	Cooperativeness	Internal Control	Physical Condition
Self-Esteem	12 (6)		10 (6)		2 (0)			
Work Orientation	19 (15)	**18 (14)**	1 (1)					
Energy Level	21 (9)	**13 (6)**			6 (1)			2 (2)
Dominance	12 (12)		**12 (12)**					
Traditional Values	11 (7)			**5 (4)**			5 (3)	
Conscientiousness	15 (11)	9 (8)		**6 (3)**				
Nondelinquency	20 (13)			**20 (13)**				
Emotional Stability	17 (11)				**17 (11)**			
Cooperativeness	18 (11)			2 (1)		**16 (10)**		
Internal Control	16 (11)	2 (0)			2 (1)		**12 (10)**	
Physical Condition	6 (6)							**6 (6)**
Poor Impression	2 (2)				2 (2)			
Total	169 (114)	42 (28)	23 (19)	33 (21)	29 (15)	16 (10)	17 (13)	8 (8)

Note. ABLE-114 items are shown in parentheses. Shaded areas indicate convergence between the rational and factor composites.

Chapter 3
PREDICTION OF PERFORMANCE IN TRAINING

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This chapter summarizes the results of tests of the validity of the ASVAB and the Project A Longitudinal Validation (LV) Experimental Battery for predicting training performance in the Army. The objectives of the analyses described here were as follows:

(1) Compute the validities for ASVAB and Experimental Battery predictors against peer and supervisor ratings and against written measures of training performance.

(2) Compare the validities of four alternative sets of ASVAB scores (9 ASVAB subtests vs. 4 ASVAB factor composites vs. AFQT vs. MOS-appropriate Aptitude Area composites).

(3) Compare the validities of three alternative sets of ABLE scores.

(4) Assess the incremental validities for the Experimental Battery predictors over ASVAB.

(5) Compare the validation results for the prediction of peer and supervisor ratings (controlling for number of raters per ratee).

METHOD

Sample

Of the 50,237 recruits administered the LV Experimental Battery (paper-and-pencil tests, computer tests, or both), end-of-training performance data were collected from 27,378. Following final editing of the data, there were a total of 17,503 trainees who had complete predictor (ASVAB and Experimental Battery) and criterion (Job Knowledge Test results and ratings by at least one peer and at least one supervisor) data. A breakdown of these trainees by MOS is shown in Table 3.1. Asterisks indicate those MOS in Batch A, who were given MOS-specific testing as well as the more general measures.

Note that the trainees in MOS 13B (Cannon Crewman) have been separated into two groups, 13B-S and 13B-T. These two groups correspond to two different weapon types ("self-propelled" and "towed") for which the trainees in 13B could have been trained. Because the School Knowledge Tests (described below) administered to the trainees in 13B differed according to the weapon type used in training, the two groups of trainees were treated as separate MOS for analyses incorporating scores from these tests.

Table 3.1

Trainees With Complete Predictor Data and Complete End-of-Training Criterion Data, by MOS

MOS		N
11B	Infantryman	1,798
12B	Combat Engineer	1,129
13B	Cannon Crewman[a]	
13B-S *		2,741
13B-T *		605
16S	MANPADS Crewman	394
19E *	M60 Armor Crewman	348
19K *	M1 Armor Crewman	1,251
27E	Tow/Dragon Repairer	33
29E	Comm.-Electronics Radio Repairer	82
31C *	Single Channel Radio Operator	423
51B	Carpentry/Masonry Specialist	92
54B	NBC Specialist	418
55B	Ammunition Specialist	192
63B *	Light-Wheel Vehicle Mechanic	340
67N	Utility Helicopter Repairer	190
71L *	Administrative Specialist	913
76Y	Unit Supply Specialist	563
88M *	Motor Transport Operator	403
91A *	Medical Specialist	2,447
94B	Food Service Specialist	431
95B *	Military Police	2,598
96B	Intelligence Analyst	112
Batch A *		13,867
Total		17,503

Note. "Complete predictor data" was defined as ASVAB scores and LV Experimental Battery results. "Complete EOT criterion data" was defined as scores from School Knowledge Tests and ratings by at least one peer and at least one supervisor.

* indicates Batch A MOS.

[a] Trainees in 13B were trained (and tested) on either of two different weapons ("Self-propelled" [S] or "Towed" [T]). For analyses incorporating School Knowledge test data, these two sets of trainees were treated as belonging to separate MOS.

Measures

Predictors

The predictor scores used in these analyses were derived from the ASVAB operationally administered when these soldiers were inducted, and from the paper-and-pencil and computerized tests administered in the Project A LV

Experimental Battery. For the ASVAB, four types of scores were examined. These scores, listed in Table 3.2, include the nine ASVAB subtests, the four ASVAB factor scores, the AFQT (Armed Forces Qualification Test), and the MOS-appropriate Aptitude Area composite scores.

Table 3.2

Sets of ASVAB Scores Used in End-of-Training Validity Analyses

ASVAB Subtests
- General Science
- Arithmetic Reasoning
- Verbal (Paragraph Comprehension + Word Knowledge)
- Numerical Operations
- Coding Speed
- Auto/Shop Information
- Mathematical Knowledge
- Mechanical Comprehension
- Electronic Information

ASVAB Factor Composites[a]
- Technical (Auto/Shop Information, Mechanical Comprehension, Electronics Information subtests)
- Quantitative (Mathematical Knowledge, Arithmetic Reasoning subtests)
- Verbal (Word Knowledge, Paragraph Comprehension, General Science subtests)
- Speed (Coding Speed, Number Operations subtests)

Armed Forces Qualification Test (AFQT)[b]

Aptitude Area Composites (1 per MOS)
- 11B: CO (Combat)
- 12B: CO (Combat)
- 13B: FA (Field Artillery)
- 16S: OF (Operators/Foods)
- 19E: CO (Combat)
- 19K: CO (Combat)
- 27E: EL (Electronics)
- 29E: EL (Electronics)
- 31C: SC (Surveillance/Communications)
- 51B: GM (General Maintenance)
- 54B: ST (Skilled Technical)
- 55B: GM (General Maintenance)
- 63B: MM (Mechanical Maintenance)
- 67N: MM (Mechanical Maintenance)
- 71L: CL (Clerical)
- 76Y: CL (Clerical)
- 88M: OF (Operators/Foods)
- 91A: ST (Skilled Technical)
- 94B: OF (Operators/Foods)
- 95B: ST (Skilled Technical)
- 96B: ST (Skilled Technical)

[a] For information on the ASVAB factor analyses, see, for example, Anoberg, Stillwell, Prestwood, & Welsh, ...; Kass, Mitchell, Grafton, & Wing, 1982.
[b] Composite of four ASVAB subtests with math and verbal content.

The scores derived from the LV Experimental Battery are listed in Table 3.3. With one exception, these scores are described in the Career Force first annual report (Campbell & Zook, 1990). The exception concerns the scores derived for the ABLE. Note that three different sets of ABLE scores are listed in Table 3.3. The first set, labeled the ABLE Rational Composites, was derived along with the other LV predictor composites. The other two sets, labeled ABLE-168 Factor Composites and ABLE-114 Factor Composites, were based on results of factor analyses of the ABLE items, using 168 items and 114 items respectively. See Chapter 2 for a description of the development of the ABLE factor scores.

Table 3.3

Sets of LV Experimental Predictor Battery Scores Used in End-of-Training Validity Analyses

Spatial Composite
- Spatial

Computer Composites
- Psychomotor
- Perceptual Speed
- Perceptual Accuracy
- Number Speed and Accuracy
- Basic Speed
- Basic Accuracy
- Short-Term Memory
- Movement Time

JOB Composites
- Autonomy
- High Expectations
- Routine

AVOICE Composites
- Administrative
- Audiovisual Arts
- Food Service
- Structural/Machines
- Protective Services
- Rugged/Outdoors
- Social
- Skilled Technical

ABLE Rational Composites
- Achievement Orientation
- Adjustment
- Physical Condition
- Internal Control
- Cooperativeness
- Dependability
- Leadership

ABLE-168 Factor Composites
- Locus of Control
- Cooperativeness
- Dominance
- Dependability
- Physical Condition
- Stress Tolerance
- Work Orientation

ABLE-114 Factor Composites
- Locus of Control
- Cooperativeness
- Dominance
- Dependability
- Physical Condition
- Stress Tolerance
- Work Orientation

Criteria

The end-of-training criterion measures consisted of written tests of school knowledge as well as ratings obtained from peers and supervisors. These measures were described in detail in Campbell and Zook (1990). Briefly, a written test of school knowledge was developed separately for each MOS.

Based on results of confirmatory factor analyses, two scores (referred to as Technical and Basic) were derived from these tests for all but two MOS, 11B and 88M, for which only the Technical score was created. Additionally, a Total score was created for each MOS; for trainees in 11B and 88M, the Technical score served as the Total score.

The end-of-training ratings consisted of seven scales revised from the 10 Behaviorally Anchored Rating Scales (BARS) developed to assess first-tour Army-wide performance (Pulakos & Borman, 1986). Based on the results of exploratory and confirmatory factor analyses (also reported in Campbell & Zook, 1990), the seven scales were reduced to four unit-weighted composites: Effort and Technical Skill (ETS), Maintaining Personal Discipline (MPD), Physical Fitness and Military Bearing (PFB), and Leadership Potential (LEAD). These composites were computed separately for peer and supervisor ratings.

For most analyses, the intention was to obtain the most reliable ratings of training performance possible. In those instances, ratings were averaged across multiple raters (again, separately for peer and supervisor ratings), regardless of the number of ratings available for a particular ratee. As indicated before, the number of trainees with complete predictor data and complete criterion data (i.e., School Knowledge Test data and ratings from at least one peer and one supervisor rater) was reported in Table 3.1. These trainees were used for the analyses described in Steps A and B below.

For some analyses, the purpose was to compare validation results across rater types (i.e., peers vs. supervisors) or MOS. Since the average number of ratings per ratee varied across both of these, this element was controlled by constraining the number of peer and supervisor ratings for each trainee in the sample to be the same. Specifically, as described in Campbell and Zook (1990), two sets of peer ratings (one labeled "Peer 1," the other "Peer 2") and one set of supervisor ratings were selected randomly for each trainee in the Table 3.1 sample who had been rated by at least that many raters. (Note: Only 246 trainees had been rated by more than one supervisor.) These trainees (with at least two sets of peer and one set of supervisor ratings, as well as complete predictor data) were used in analyses comparing the validity results associated with peer and supervisor ratings (see step C below). A breakdown of these trainees by MOS is reported in Table 3.4.

Procedure

The end-of-training validation analysis procedure consisted of the following steps:

A) Using the sample shown in Table 3.1, multiple correlations between each set of predictor scores and each set of criterion scores (the three written School Knowledge Test scores, the four "average" peer rating scores, and the four "average" supervisor rating scores) were computed separately by MOS. They were then averaged across the Batch A MOS and across all MOS.

Table 3.4

Trainees With Complete Predictor Data, School Knowledge Test Data, and End-of-Training Ratings From Two Peers and One Supervisor, by MOS

MOS	N
11B *	1,759
12B	1,041
13B *	3,305
16S	329
19E *	341
19K *	1,164
27E	33
29E	84
31C *	377
51B	91
54B	370
55B	189
63B *	288
67N	191
71L *	843
76Y	524
88M *	352
91A *	2,373
94B	385
95B *	2,519
96B	114
Batch A *	13,321
Total	16,672

Note: For analyses using ratings data only, the distinction between trainees in 13B-S and 13B-T was not made.

* indicates Batch A MOS.

1) As indicated above, the ASVAB predictor set was represented by

   a) The nine ASVAB subtest scores;
   b) The four ASVAB factor scores;
   c) The AFQT; and
   d) The MOS-appropriate Aptitude Area composite score.

2) The ABLE predictor set was represented by three sets of scores:

   a) The seven rational scales developed for the Experimental Battery;
   b) Seven empirical scales developed on the basis of a factor analysis that retained all of the items (and that used 168 of them); and
   c) Seven empirical scales developed by using the results of the factor analysis to select the best items to reflect each factor (and that used only 114 items).

3) Each of the other predictor sets was represented by a single set of scores as described above and in Table 3.3.

All results were adjusted for shrinkage using Rozeboom's (1978) Formula 8. Also, results were computed both with and without correcting for multivariate range restriction. Corrections for range restriction were made using the 9x9 intercorrelation matrix among the ASVAB subtests in the 1980 Youth Population (Department of Defense, 1982).

B) Incremental validity results for each set of Experimental Battery predictors over the ASVAB were computed against the same criteria used in the preceding step. Once again, results were computed separately by MOS and then averaged across the Batch A MOS and all MOS combined.

For this step, only one set of ABLE scores (the seven rational composites) was examined. However, incremental validity was assessed with respect to each set of ASVAB scores described above. These results were adjusted for shrinkage and corrected for multivariate range restriction. For the incremental validities against the nine ASVAB subtests and the four ASVAB factors, results were also computed without the corrections for range restriction.

C) Using the sample shown in Table 3.4, multiple correlations between each set of predictor scores and the four single-rater "Peer 1" rating composites, the four single-rater "Peer 2" rating composites, the four single-rater supervisor rating composites, and various combinations (averages) of these composites were computed separately by MOS, and then averaged across the Batch A MOS and all MOS combined.

For these analyses, only one set of ASVAB scores (the four ASVAB factor composites) and one set of ABLE scores (the seven rational composites) were used. Once again, the results were adjusted for shrinkage and corrected for multivariate range restriction.

RESULTS

Multiple Correlations for ASVAB and LV Experimental Battery Predictors

Multiple correlations for six predictor sets--the four ASVAB factors, the single spatial composite, the eight computer composites, the three JOB composites, the seven ABLE rational composites, and the eight AVOICE composites--are reported in Table 3.5. As indicated above, these results were computed separately by MOS, and then averaged across the Batch A MOS and across all MOS. These results have also been adjusted for shrinkage and corrected for multivariate range restriction. Results that have not been corrected for range restriction (but have been adjusted for shrinkage) are reported in Table 3.6.

The first four criteria (i.e., Peer-ETS, Peer-MPD, Peer-PFB, and Peer-LEAD) in these tables are the rating composite scores averaged across all peer raters. Likewise, the second four criteria (Supv-ETS, Supv-MPD, Supv-PFB, and Supv-LEAD) are the rating composite scores averaged across all supervisor raters (although, as noted earlier, the majority of ratees were evaluated by only one supervisor). Finally, the last three criteria (SK-Basic, SK-Tech, and SK-Total) are the scores from the School Knowledge tests.

The ASVAB factors were the single best set of predictors for each of the criteria considered, with one exception, according to the corrected results reported in Table 3.5. The exception was the average peer rating of PFB (which was better predicted by ABLE). The pattern of uncorrected results reported in Table 3.6 is very similar to that in Table 3.5.

These results also show that the level of validity of the ASVAB factors for predicting the School Knowledge Test scores was extremely high, especially for the Technical (SK-Tech) and Total (SK-Total) scores. Likewise, the spatial composite and the computer battery produced high validities for these criteria.

Finally, the results seem to indicate that peer ratings of training performance are more highly predicted than are supervisor ratings. However, the fact that the average peer ratings are based on a greater number of raters per ratee than are the supervisor ratings (and are therefore probably more reliable) confounds these latter findings.

The average multiple correlations for the four different sets of ASVAB scores are reported in Tables 3.7 and 3.8 (corrected and uncorrected for range restriction, respectively). When used to predict the average peer and supervisor rating composites, the nine ASVAB subtests, the four ASVAB factors, the AFQT, and the MOS-appropriate Aptitude Area composites differ only slightly in validity (except that the peer ratings of Physical Fitness, PFB are better predicted by the nine subtests and the four factors). However, the School Knowledge Test scores are predicted somewhat better (about three to five points) by the ASVAB subtests and factors than by the AFQT or Aptitude Area composites.

Table 3.5

Mean of Multiple Correlations Computed Within-Job for End-of-Training Sample for ASVAB Factors, Spatial, Computer, JOB, ABLE Rational Composites, and AVOICE: Results Corrected for Range Restriction

Criterion[a]	MOS	No. of MOS[b]	ASVAB Factors [4]	Spatial [1]	Computer [8]	JOB [3]	ABLE Comp. [7]	AVOICE [8]
Peer-ETS	Batch A	11	41 (07)	35 (05)	36 (05)	24 (06)	19 (09)	22 (07)
	All MOS	22	43 (13)	37 (10)	33 (14)	23 (11)	23 (12)	23 (10)
Peer-MPD	Batch A	11	25 (04)	22 (05)	21 (05)	09 (07)	19 (05)	11 (07)
	All MOS	22	26 (11)	22 (08)	15 (10)	12 (10)	22 (10)	09 (09)
Peer-PFB	Batch A	11	14 (09)	05 (06)	11 (05)	05 (05)	29 (06)	07 (07)
	All MOS	22	19 (14)	10 (11)	12 (09)	09 (12)	26 (11)	10 (10)
Peer-LEAD	Batch A	11	30 (10)	24 (07)	28 (07)	18 (09)	22 (09)	17 (10)
	All MOS	22	30 (16)	26 (12)	25 (16)	20 (14)	22 (12)	16 (14)
Supv-ETS	Batch A	11	21 (06)	18 (05)	17 (10)	10 (08)	09 (10)	11 (10)
	All MOS	22	27 (15)	22 (11)	18 (13)	10 (10)	11 (12)	10 (10)
Supv-MPD	Batch A	11	13 (09)	12 (07)	11 (08)	06 (06)	05 (06)	06 (06)
	All MOS	22	16 (16)	14 (11)	10 (13)	06 (08)	05 (07)	04 (06)
Supv-PFB	Batch A	11	11 (07)	09 (05)	09 (08)	06 (05)	11 (09)	07 (07)
	All MOS	22	16 (15)	13 (12)	11 (15)	05 (07)	11 (11)	05 (06)
Supv-LEAD	Batch A	11	15 (10)	14 (08)	13 (10)	08 (08)	10 (11)	08 (09)
	All MOS	22	19 (17)	17 (11)	12 (12)	11 (09)	11 (12)	07 (09)
SK-Basic	Batch A	9	58 (06)	57 (06)	57 (06)	38 (05)	30 (07)	37 (05)
	All MOS	20	67 (08)	58 (07)	55 (14)	36 (10)	31 (14)	37 (11)
SK-Tech	Batch A	11	76 (05)	53 (05)	61 (05)	41 (07)	33 (05)	44 (07)
	All MOS	22	75 (06)	62 (08)	59 (06)	38 (11)	33 (13)	40 (12)
SK-Total	Batch A	11	78 (03)	65 (04)	64 (03)	43 (07)	34 (05)	45 (06)
	All MOS	22	77 (05)	65 (07)	62 (07)	40 (11)	35 (14)	42 (13)

Note: Adjusted for shrinkage (Rozeboom formula 8). Numbers in parentheses are standard deviations. Numbers in brackets are the numbers of predictor scores entering prediction equations. Decimals omitted.

[a] ETS = Effort and Technical Skill; MPD = Maintaining Personal Discipline; PFB = Physical Fitness and Military Bearing; LEAD = Leadership Potential; SK = School Knowledge.
[b] Number of MOS for which validities were computed.

Table 3.6

Mean of Multiple Correlations Computed Within-Job for End-of-Training Sample for ASVAB Factors, Spatial, Computer, JOB, ABLE Rational Composites, and AVOICE: Results Uncorrected for Range Restriction

Criterion[a]	MOS	No. of MOS[b]	ASVAB Factors [4]	Spatial [1]	Computer [8]	JOB [3]	ABLE Comp. [7]	AVOICE [8]
Peer-ETS	Batch A	11	23 (06)	19 (07)	16 (05)	08 (06)	14 (08)	07 (06)
	All MOS	22	23 (08)	20 (08)	14 (07)	07 (07)	12 (09)	04 (06)
Peer-MPD	Batch A	11	15 (06)	13 (07)	09 (06)	03 (04)	21 (05)	06 (04)
	All MOS	22	13 (08)	11 (08)	06 (06)	05 (08)	21 (07)	03 (04)
Peer-PFB	Batch A	11	11 (08)	04 (02)	09 (05)	05 (04)	28 (08)	06 (06)
	All MOS	22	11 (09)	06 (07)	08 (08)	06 (12)	24 (11)	06 (07)
Peer-LEAD	Batch A	11	14 (08)	12 (04)	14 (04)	07 (06)	18 (08)	09 (06)
	All MOS	22	16 (08)	14 (07)	11 (08)	08 (09)	15 (10)	06 (06)
Supv-ETS	Batch A	11	09 (06)	10 (04)	07 (07)	03 (03)	07 (07)	05 (06)
	All MOS	22	11 (10)	10 (04)	05 (06)	02 (03)	07 (08)	03 (05)
Supv-MPD	Batch A	11	04 (06)	07 (04)	03 (03)	02 (02)	05 (06)	02 (03)
	All MOS	22	07 (09)	07 (04)	02 (04)	02 (04)	05 (06)	01 (03)
Supv-PFB	Batch A	11	04 (05)	05 (03)	05 (05)	03 (04)	11 (09)	04 (05)
	All MOS	22	06 (07)	07 (06)	04 (07)	02 (05)	09 (10)	02 (04)
Supv-LEAD	Batch A	11	07 (06)	07 (04)	06 (05)	04 (04)	09 (09)	04 (06)
	All MOS	22	06 (08)	08 (05)	04 (05)	04 (06)	09 (10)	03 (05)
SK-Basic	Batch A	9	47 (11)	36 (12)	29 (09)	16 (08)	10 (09)	17 (11)
	All MOS	20	43 (10)	35 (10)	25 (12)	12 (09)	10 (10)	12 (11)
SK-Tech	Batch A	11	58 (12)	42 (12)	35 (09)	18 (09)	13 (09)	25 (14)
	All MOS	22	55 (13)	41 (12)	31 (13)	15 (10)	12 (11)	19 (15)
SK-Total	Batch A	11	60 (09)	44 (10)	37 (08)	19 (09)	14 (08)	25 (13)
	All MOS	22	57 (11)	43 (11)	33 (11)	15 (10)	14 (12)	18 (15)

Note: Adjusted for shrinkage (Rozeboom formula 8). Numbers in parentheses are standard deviations. Numbers in brackets are the numbers of predictor scores entering prediction equations. Decimals omitted.

[a] ETS = Effort and Technical Skill; MPD = Maintaining Personal Discipline; PFB = Physical Fitness and Military Bearing; LEAD = Leadership Potential; SK = School Knowledge.
[b] Number of MOS for which validities were computed.

Table 3.7

Mean of Multiple Correlations Computed Within-Job for End-of-Training Sample for ASVAB Subtests, ASVAB Factors, AFQT, and ASVAB Aptitude Area[a]: Results Corrected for Range Restriction

Criterion[b]	MOS	No. of MOS[c]	ASVAB Subtests [9]	ASVAB Factors [4]	AFQT [1]	Aptitude Areas[a] [13]
Peer-ETS	Batch A	11	41 (07)	41 (07)	38 (07)	41 (07)
	All MOS	22	40 (17)	43 (13)	41 (14)	42 (13)
Peer-MPD	Batch A	11	25 (05)	25 (04)	24 (06)	25 (05)
	All MOS	22	23 (11)	26 (11)	26 (11)	27 (11)
Peer-PFB	Batch A	11	15 (08)	14 (09)	06 (04)	08 (06)
	All MOS	22	17 (11)	19 (14)	12 (12)	14 (12)
Peer-LEAD	Batch A	11	30 (11)	30 (10)	27 (10)	29 (09)
	All MOS	22	29 (17)	30 (16)	28 (17)	29 (16)
Supv-ETS	Batch A	11	19 (09)	21 (06)	19 (08)	19 (07)
	All MOS	22	24 (16)	27 (15)	24 (15)	25 (16)
Supv-MPD	Batch A	11	12 (09)	13 (09)	15 (05)	14 (07)
	All MOS	22	13 (16)	16 (16)	16 (13)	16 (15)
Supv-PFB	Batch A	11	09 (09)	11 (07)	10 (05)	10 (05)
	All MOS	22	12 (16)	16 (15)	14 (12)	15 (14)
Supv-LEAD	Batch A	11	14 (11)	15 (10)	15 (07)	15 (08)
	All MOS	22	17 (16)	19 (17)	19 (14)	20 (15)
SK-Basic	Batch A	9	68 (06)	68 (06)	66 (06)	65 (06)
	All MOS	20	68 (07)	67 (08)	65 (12)	64 (09)
SK-Tech	Batch A	11	77 (05)	76 (05)	71 (06)	74 (06)
	All MOS	22	75 (06)	75 (06)	68 (12)	71 (10)
SK-Total	Batch A	11	79 (04)	78 (03)	74 (04)	76 (04)
	All MOS	22	77 (05)	77 (05)	71 (12)	73 (09)

Note: Adjusted for shrinkage (Rozeboom formula 8). Numbers in parentheses are standard deviations. Numbers in brackets are the numbers of predictor scores entering prediction equations. Decimals omitted.

[a] MOS-appropriate Aptitude Area Composites.

[b] ETS = Effort and Technical Skill; MPD = Maintaining Personal Discipline; PFB = Physical Fitness and Military Bearing; LEAD = Leadership Potential; SK = School Knowledge.

[c] Number of MOS for which validities were computed.

Table 3.8

Mean of Multiple Correlations Computed Within-Job for End-of-Training Sample for ASVAB Subtests, ASVAB Factors, AFQT, and ASVAB Aptitude Area[a]: Results Uncorrected for Range Restriction

Criterion[b]	MOS	No. of MOS[c]	ASVAB Subtests [9]	ASVAB Factors [4]	AFQT [1]	Aptitude Areas[a] [13]
Peer-ETS	Batch A	11	23 (05)	23 (06)	20 (04)	23 (06)
	All MOS	22	20 (10)	23 (08)	23 (07)	24 (08)
Peer-MPD	Batch A	11	14 (08)	15 (06)	17 (03)	17 (05)
	All MOS	22	10 (09)	13 (08)	16 (07)	16 (07)
Peer-PFB	Batch A	11	12 (07)	11 (08)	04 (02)	04 (03)
	All MOS	22	08 (08)	11 (09)	05 (05)	05 (04)
Peer-LEAD	Batch A	11	15 (06)	14 (08)	12 (04)	15 (05)
	All MOS	22	12 (08)	16 (08)	13 (08)	15 (08)
Supv-ETS	Batch A	11	06 (06)	09 (06)	09 (03)	10 (03)
	All MOS	22	07 (08)	11 (10)	11 (06)	13 (08)
Supv-MPD	Batch A	11	03 (05)	04 (06)	07 (03)	07 (04)
	All MOS	22	04 (06)	07 (09)	08 (04)	09 (07)
Supv-PFB	Batch A	11	04 (06)	04 (05)	04 (03)	04 (03)
	All MOS	22	03 (05)	06 (07)	04 (05)	06 (05)
Supv-LEAD	Batch A	11	05 (07)	07 (06)	06 (03)	08 (04)
	All MOS	22	05 (06)	06 (08)	08 (05)	10 (07)
SK-Basic	Batch A	9	47 (11)	47 (11)	45 (10)	42 (09)
	All MOS	20	42 (11)	43 (10)	42 (09)	39 (08)
SK-Tech	Batch A	11	59 (12)	58 (12)	53 (08)	54 (11)
	All MOS	22	54 (17)	55 (13)	50 (09)	52 (10)
SK-Total	Batch A	11	61 (09)	60 (09)	55 (06)	55 (08)
	All MOS	22	55 (14)	57 (11)	52 (09)	52 (09)

Note: Adjusted for shrinkage (Rozeboom formula 8). Numbers in parentheses are standard deviations. Numbers in brackets are the numbers of predictor scores entering prediction equations. Decimals omitted.

[a] MOS-appropriate Aptitude Area Composites.
[b] ETS = Effort and Technical Skill; MPD = Maintaining Personal Discipline; PFB = Physical Fitness and Military Bearing; LEAD = Leadership Potential; SK = School Knowledge.
[c] Number of MOS for which validities were computed.

The average multiple correlations for the three sets of ABLE scores are reported in Tables 3.9 and 3.10 (corrected and uncorrected for range restriction, respectively). These results indicate very little difference across the three sets of scores in their ability to predict training performance.

Table 3.9

Mean of Multiple Correlations Computed Within-Job for End-of-Training Sample for ABLE Rational Composites, ABLE-168 Composites Items, and ABLE-114 Composites Items: Results Corrected for Range Restriction

Criterion[a]	MOS	No. of MOS[b]	ABLE Rational [7]	ABLE-168 [7]	ABLE-114 [7]
Peer-ETS	Batch A	11	19 (09)	19 (10)	21 (09)
	All MOS	22	23 (12)	21 (12)	21 (12)
Peer-MPD	Batch A	11	19 (05)	22 (05)	22 (05)
	All MOS	22	22 (10)	22 (10)	23 (10)
Peer-PFB	Batch A	11	29 (06)	29 (07)	29 (07)
	All MOS	22	26 (11)	26 (11)	26 (11)
Peer-LEAD	Batch A	11	22 (09)	23 (10)	24 (09)
	All MOS	22	22 (12)	24 (11)	24 (12)
Supv-ETS	Batch A	11	09 (10)	10 (10)	10 (10)
	All MOS	22	11 (12)	12 (12)	11 (12)
Supv-MPD	Batch A	11	05 (06)	06 (07)	06 (07)
	All MOS	22	05 (07)	05 (07)	07 (08)
Supv-PFB	Batch A	11	11 (09)	13 (08)	13 (09)
	All MOS	22	11 (11)	11 (10)	11 (10)
Supv-LEAD	Batch A	11	10 (11)	11 (12)	11 (12)
	All MOS	22	11 (12)	12 (12)	11 (12)
SK-Basic	Batch A	9	30 (07)	29 (08)	31 (07)
	All MOS	20	31 (14)	29 (15)	31 (14)
SK-Tech	Batch A	11	33 (05)	32 (06)	33 (07)
	All MOS	22	33 (13)	31 (14)	32 (13)
SK-Total	Batch A	11	34 (05)	34 (06)	35 (07)
	All MOS	22	35 (14)	33 (15)	34 (14)

Note: Adjusted for shrinkage (Rozeboom formula 8). Numbers in parentheses are standard deviations. Numbers in brackets are the numbers of predictor scores entering prediction equations. Decimals omitted.

[a] ETS = Effort and Technical Skill; MPD = Maintaining Personal Discipline; PFB = Physical Fitness and Military Bearing; LEAD = Leadership Potential; SK = School Knowledge.
[b] Number of MOS for which validities were computed.

Table 3.10

Mean of Multiple Correlations Computed Within-Job for End-of-Training Sample for ABLE Rational Composites, ABLE-168 Composites Items, and ABLE-114 Composites Items: Results Uncorrected for Range Restriction

Criterion[a]	MOS	No. of MOS[b]	ABLE Rational [7]	ABLE-168 [7]	ABLE-114 [7]
Peer-ETS	Batch A	11	14 (08)	14 (08)	15 (08)
	All MOS	22	12 (09)	11 (09)	12 (09)
Peer-MPD	Batch A	11	21 (05)	24 (04)	24 (05)
	All MOS	22	21 (07)	22 (08)	23 (08)
Peer-PFB	Batch A	11	28 (08)	28 (10)	28 (10)
	All MOS	22	24 (11)	24 (12)	24 (12)
Peer-LEAD	Batch A	11	18 (08)	19 (10)	19 (10)
	All MOS	22	15 (10)	16 (10)	16 (10)
Supv-ETS	Batch A	11	07 (07)	07 (08)	08 (08)
	All MOS	22	07 (08)	08 (08)	07 (08)
Supv-MPD	Batch A	11	05 (06)	06 (06)	07 (06)
	All MOS	22	05 (06)	05 (07)	06 (07)
Supv-PFB	Batch A	11	11 (09)	13 (08)	12 (09)
	All MOS	22	09 (10)	10 (09)	10 (10)
Supv-LEAD	Batch A	11	09 (09)	09 (10)	09 (10)
	All MOS	22	09 (10)	09 (10)	09 (10)
SK-Basic	Batch A	9	10 (09)	09 (09)	10 (08)
	All MOS	20	10 (10)	08 (10)	09 (10)
SK-Tech	Batch A	11	13 (09)	14 (09)	14 (09)
	All MOS	22	12 (11)	12 (11)	11 (11)
SK-Total	Batch A	11	14 (08)	15 (08)	15 (07)
	All MOS	22	14 (12)	13 (11)	13 (10)

Note: Adjusted for shrinkage (Rozeboom formula 8). Numbers in parentheses are standard deviations. Numbers in brackets are the numbers of predictor scores entering prediction equations. Decimals omitted.

[a] ETS = Effort and Technical Skill; MPD = Maintaining Personal Discipline; PFB = Physical Fitness and Military Bearing; LEAD = Leadership Potential; SK = School Knowledge.
[b] Number of MOS for which validities were computed.

Incremental Validities for the Experimental Battery Predictors Over ASVAB

Incremental validity results for the Experimental Battery predictors over ASVAB are reported in Tables 3.11-3.16. Table 3.11 contains the average multiple correlations of each set of Experimental Battery predictors in combination with the nine ASVAB subtests. These results have been adjusted for shrinkage and corrected for range restriction. Underlined numbers indicate validities higher than those obtained with the nine ASVAB subtests alone (which are reported in italics).

The results in Table 3.11 show that the ABLE composites contribute to the prediction of both the peer and supervisor average ratings, but more so for peers than for supervisors. The results demonstrate very little incremental validity over the ASVAB subtests for the other predictor domains.

The average results for the incremental validities of the Experimental Battery predictors over the four ASVAB factors are reported in Table 3.12 (adjusted for shrinkage and corrected for range restriction). These results indicate approximately the same pattern and degree of incremental validity of the Experimental Battery predictors over ASVAB as were indicated in Table 3.11.

Tables 3.13 and 3.14 report the average incremental validity results for the Experimental Battery predictors over the AFQT and the MOS-appropriate Aptitude Area composites, respectively. Also adjusted for shrinkage and corrected for range restriction, the results in these tables indicate greater incremental validities over ASVAB than those shown in Tables 3.11 and 3.12. This is attributable, however, to the lower levels of validity associated with the AFQT and Aptitude Area composites for certain criteria (e.g., the School Knowledge Test scores), rather than to greater levels of validity from the combined use of these ASVAB scores and the Experimental Battery predictors.

The final incremental validity results are reported in Tables 3.15 and 3.16. These tables contain the average incremental validity results for the Experimental Battery predictors over the nine ASVAB subtests and the four ASVAB factors, respectively, uncorrected for range restriction. The primary reason for computing these results was to compare them with the corrected results reported in Tables 3.11 and 3.12 to determine how the estimates of incremental validity are affected by the range restriction corrections.

These comparisons indicate greater estimated levels of incremental validity for the Experimental Battery when the data are <u>not</u> corrected for range restriction. Specifically, when there is no correction for range restriction, the incremental validities obtained for the ABLE are mostly two to three points higher than the incremental validities obtained after correcting for range restriction, with the difference being as much as five points in some cases. For the other Experimental Battery predictors, the differences between the incremental validities estimated on corrected and uncorrected data are more modest. The incremental validities estimated without the range restriction correction are only one point higher (if at all) than the corrected incremental validities.

Table 3.11

Mean of Incremental Correlations Over ASVAB Subtests Computed Within-Job for End-of-Training Sample for Spatial, Computer, JOB, ABLE Composites, and AVOICE: Results Corrected for Range Restriction

Criterion[a]	MOS	No. of MOS[b]	A9 ASVAB Subtests [9]	A9+ Spatial [10]	A9+ Computer [17]	A9+ JOB [3]	A9+ ABLE Comp. [7]	A9+ AVOICE [8]
Peer-ETS	Batch A	11	*41* (07)	42 (07)	41 (06)	41 (07)	44 (06)	41 (07)
	All MOS	22	*40* (17)	41 (17)	39 (16)	40 (16)	42 (15)	39 (16)
Peer-MPD	Batch A	11	*25* (05)	25 (05)	23 (08)	24 (06)	34 (05)	23 (08)
	All MOS	22	*23* (11)	22 (12)	20 (12)	21 (12)	32 (10)	20 (11)
Peer-PFB	Batch A	11	*15* (08)	15 (08)	17 (07)	15 (09)	31 (09)	16 (09)
	All MOS	22	*17* (11)	16 (11)	15 (12)	18 (16)	29 (13)	16 (11)
Peer-LEAD	Batch A	11	*30* (11)	29 (11)	31 (09)	29 (13)	35 (09)	30 (13)
	All MOS	22	*29* (17)	29 (17)	27 (19)	29 (18)	33 (16)	27 (19)
Supv-ETS	Batch A	11	*19* (09)	19 (09)	18 (11)	18 (09)	17 (13)	16 (13)
	All MOS	22	*24* (16)	24 (16)	21 (15)	22 (16)	24 (20)	20 (16)
Supv-MPD	Batch A	11	*12* (09)	12 (09)	10 (09)	10 (10)	12 (11)	10 (10)
	All MOS	22	*13* (16)	13 (15)	10 (15)	12 (16)	13 (16)	10 (14)
Supv-PFB	Batch A	11	*09* (09)	09 (09)	10 (08)	09 (09)	13 (11)	09 (10)
	All MOS	22	*12* (16)	12 (15)	10 (12)	11 (14)	15 (15)	09 (12)
Supv-LEAD	Batch A	11	*14* (11)	14 (11)	13 (11)	13 (12)	16 (14)	13 (12)
	All MOS	22	*17* (16)	17 (16)	13 (14)	17 (16)	19 (17)	14 (14)
SK-Basic	Batch A	9	*68* (06)	69 (06)	68 (06)	68 (06)	68 (06)	68 (06)
	All MOS	20	*68* (07)	68 (07)	65 (14)	67 (08)	68 (08)	66 (11)
SK-Tech	Batch A	11	*77* (05)	77 (05)	77 (05)	77 (05)	77 (05)	77 (06)
	All MOS	22	*75* (06)	75 (06)	75 (06)	75 (06)	75 (07)	74 (08)
SK-Total	Batch A	11	*79* (04)	79 (03)	79 (03)	78 (04)	79 (04)	78 (04)
	All MOS	22	*77* (05)	77 (05)	77 (05)	77 (05)	77 (05)	76 (07)

Note. Adjusted for shrinkage (Rozeboom formula 8). Numbers in parentheses are standard deviations. Numbers in brackets are the numbers of predictor scores entering prediction equations. Multiple Rs for ASVAB Subtests alone are in italics. Underlined numbers denote multiple Rs greater than for ASVAB Subtests alone. Decimals omitted.

[a] ETS = Effort and Technical Skill; MPD = Maintaining Personal Discipline; PFB = Physical Fitness and Military Bearing; LEAD = Leadership Potential; SK = School Knowledge.
[b] Number of MOS for which validities were computed.

T ble 3.12

M an of Incremental Correlations Over ASVAB Factors Computed Within-Job for d-of-Training Sample for Spatial, Computer, JOB, ABLE Composites, and OICE: Results Corrected for Range Restriction

terion[a]	MOS	No. of MOS[b]	A4 ASVAB Factors [4]	A4+ Spatial [5]	A4+ Computer [12]	A4+ JOB [7]	A4+ ABLE Comp. [11]	A4+ AVOICE [12]
r-ETS	Batch A	11	*41* (07)	42 (07)	4[illegible] (06)	41 (07)	44 (06)	41 (07)
	All MOS	22	*43* (13)	42 (14)	4[illegible] (16)	42 (13)	45 (11)	41 (14)
r-MPD	Batch	11	*25* (04)	25 (05)	24 (05)	25 (05)	34 (06)	24 (07)
	All I	22	*26* (11)	25 (11)	22 (12)	25 (12)	33 (11)	22 (11)
r-PFB	Batch A	1[illegible]	*14* (09)	13 (09)	17 (07)	15 (09)	31 (09)	15 (09)
	All MOS	22	*19* (14)	18 (14)	16 (12)	19 (17)	30 (14)	18 (11)
r-LEAD	Batch A	11	*30* (10)	30 (10)	31 (08)	30 (11)	35 (09)	29 (13)
	All MOS	22	*30* (16)	30 (17)	28 (18)	31 (18)	34 (15)	28 (18)
v-ETS	Batch A	11	*21* (06)	21 (07)	19 (09)	20 (06)	19 (12)	17 (12)
	All MOS	22	*27* (15)	26 (15)	24 (15)	25 (15)	25 (19)	22 (15)
v-MPD	Batch A	11	*13* (09)	12 (09)	11 (09)	11 (09)	13 (11)	11 (10)
	All MOS	22	*16* (16)	16 (16)	12 (17)	14 (17)	16 (16)	11 (14)
v-PFB	Batch A	11	*11* (07)	11 (07)	10 (08)	10 (07)	16 (09)	10 (09)
	All MOS	22	*16* (15)	15 (14)	12 (15)	14 (13)	18 (13)	11 (13)
v-LEAD	Batch A	11	*15* (10)	14 (10)	14 (11)	14 (10)	16 (13)	13 (12)
	All MOS	22	*19* (17)	19 (17)	15 (15)	19 (16)	20 (17)	15 (15)
Basic	Batch A	9	*63* (06)	69 (06)	68 (06)	68 (06)	68 (07)	68 (06)
	All MOS	20	*67* (08)	68 (08)	65 (16)	67 (09)	66 (11)	66 (10)
Tech	Batch A	11	*76* (05)	77 (05)	77 (05)	76 (05)	76 (05)	76 (05)
	All MOS	22	*75* (06)	75 (06)	75 (05)	75 (06)	75 (07)	74 (07)
Total	Batch A	11	*78* (03)	79 (03)	79 (03)	78 (03)	79 (03)	78 (04)
	All MOS	22	*77* (05)	77 (05)	77 (05)	7[illegible] (05)	77 (06)	76 (06)

: Adjusted for shrinkage (Rozeboom formula 8). Numbers in parentheses are standard deviations. Numbers in brackets are the numbers of predictor scores entering prediction equations. Multiple Rs for ASVAB Factors alone are in italics. Underlined numbers denote multiple Rs greater than for ASVAB Factors alone. Decimals omitted.

[a] S = Effort and Technical Skill; MPD = Maintaining Personal Discipline; PFB = Physical Fitness and tary Bearing; LEAD = Leadership Potential; SK = School Knowledge.

[b] er of MOS for which validities were computed.

Table 3.13

Mean of Incremental Correlations Over AFQT Computed Within-Job for End-of-Training Sample for Spatial, Computer, JOB, ABLE Composites, and AVOICE: Results Corrected for Range Restriction

Criterion[a]	MOS	No. of MOS[b]	AFQT [1]	AFQT+ Spatial [2]	AFQT+ Computer [9]	AFQT+ JOB [4]	AFQT+ ABLE Comp. [8]	AFQT+ AVOICE [9]
Peer-ETS	Batch A	11	*38* (07)	40 (06)	39 (06)	38 (07)	41 (06)	37 (08)
	All MOS	22	*41* (14)	41 (14)	38 (16)	38 (16)	42 (12)	38 (14)
Peer-MPD	Batch A	11	*24* (06)	25 (05)	23 (06)	22 (09)	33 (08)	22 (10)
	All MOS	22	*26* (11)	24 (13)	21 (12)	24 (12)	[illegible] (12)	20 (14)
Peer-PFB	Batch A	11	*06* (04)	04 (05)	13 (03)	05 (06)	29 (06)	08 (06)
	All MOS	22	*12* (12)	10 (12)	14 (12)	10 (14)	28 (12)	12 (12)
Peer-LEAD	Batch A	11	*27* (10)	27 (10)	29 (09)	26 (11)	32 (12)	26 (13)
	All MOS	22	*28* (17)	28 (17)	27 (18)	27 (18)	31 (17)	24 (20)
Supv-ETS	Batch A	11	*19* (08)	20 (08)	19 (10)	17 (09)	17 (12)	15 (13)
	All MOS	22	*24* (15)	23 (15)	20 (14)	21 (15)	22 (15)	19 (14)
Supv-MPD	Batch A	11	*15* (05)	14 (07)	11 (08)	13 (07)	13 (10)	10 (09)
	All MOS	22	*16* (13)	12 (14)	11 (14)	12 (14)	11 (12)	09 (11)
Supv-PFB	Batch A	11	*10* (05)	09 (06)	09 (07)	09 (04)	15 (08)	08 (07)
	All MOS	22	*14* (12)	12 (13)	12 (14)	10 (10)	14 (11)	08 (10)
Supv-LEAD	Batch A	11	*15* (07)	14 (08)	13 (10)	14 (08)	15 (12)	12 (10)
	All MOS	22	*19* (14)	16 (14)	13 (12)	17 (13)	17 (13)	12 (11)
SK-Basic	Batch A	9	*66* (06)	67 (06)	66 (06)	66 (06)	66 (06)	66 (05)
	All MOS	20	*65* (12)	67 (09)	64 (16)	63 (16)	63 (16)	63 (16)
SK-Tech	Batch A	11	*71* (06)	73 (05)	72 (06)	71 (06)	71 (06)	73 (06)
	All MOS	22	*68* (12)	70 (12)	69 (10)	67 (16)	67 (16)	68 (16)
SK-Total	Batch A	11	*74* (04)	76 (03)	75 (04)	74 (04)	74 (05)	75 (04)
	All MOS	22	*71* (12)	74 (10)	72 (11)	70 (16)	71 (16)	71 (16)

Note: Adjusted for shrinkage (Rozeboom formula 8). Numbers in parentheses are standard deviations. Numbers in brackets are the numbers of predictor scores entering prediction equations. Correlations for AFQT alone are in italics. Underlined numbers denote multiple Rs greater than for AFQT alone. Decimals omitted.

[a] ETS = Effort and Technical Skill; MPD = Maintaining Personal Discipline; PFB = Physical Fitness and Military Bearing; LEAD = Leadership Potential; SK = School Knowledge.
[b] Number of MOS for which validities were computed.

Table 3.14

Mean of Incremental Correlations Over ASVAB MOS-Appropriate Aptitude Area Composites Computed Within-Job for End-of-Training Sample for Spatial, Computer, JOB, ABLE Composites, and AVOICE: Results Corrected for Range Restriction

Criterion[a]	MOS	No. of MOS[b]	AA[c] [1]	AA+ Spatial [2]	AA+ Computer [9]	AA+ JOB [4]	AA+ ABLE Comp. [8]	AA+ AVOICE [9]
Peer-ETS	Batch A	11	*40* (07)	41 (07)	41 (06)	40 (07)	43 (06)	40 (07)
	All MOS	22	*42* (13)	41 (14)	39 (16)	40 (14)	43 (12)	40 (14)
Peer-MPD	Batch A	11	*25* (05)	25 (06)	25 (06)	24 (08)	33 (07)	24 (07)
	All MOS	22	*26* (11)	24 (13)	21 (12)	25 (11)	33 (11)	22 (14)
Peer-PFB	Batch A	11	*08* (06)	05 (07)	14 (03)	08 (07)	29 (07)	09 (06)
	All MOS	22	*13* (12)	11 (12)	14 (10)	12 (14)	28 (12)	13 (11)
Peer-LEAD	Batch A	11	*29* (09)	28 (10)	31 (08)	28 (11)	34 (09)	28 (13)
	All MOS	22	*29* (16)	28 (16)	28 (17)	29 (18)	33 (16)	26 (19)
Supv-ETS	Batch A	11	*20* (06)	18 (08)	19 (10)	18 (09)	18 (11)	16 (12)
	All MOS	22	*25* (16)	24 (16)	21 (15)	23 (16)	23 (16)	21 (15)
Supv-MPD	Batch A	11	*14* (07)	12 (08)	11 (09)	12 (08)	12 (11)	10 (10)
	All MOS	22	*16* (15)	13 (15)	12 (14)	13 (16)	12 (14)	10 (13)
Supv-PFB	Batch A	11	*10* (05)	07 (05)	09 (07)	08 (05)	14 (09)	08 (07)
	All MOS	22	*13* (14)	12 (14)	12 (14)	11 (12)	16 (11)	09 (10)
Supv-LEAD	Batch A	11	*15* (08)	14 (09)	13 (11)	14 (09)	16 (13)	13 (11)
	All MOS	22	*20* (15)	18 (15)	14 (14)	18 (15)	19 (14)	13 (13)
SK-Basic	Batch A	9	*65* (06)	66 (06)	66 (06)	65 (06)	65 (06)	65 (06)
	All MOS	20	*64* (09)	65 (08)	62 (16)	62 (12)	61 (16)	63 (12)
SK-Tech	Batch A	11	*73* (06)	74 (05)	74 (06)	74 (06)	74 (06)	74 (06)
	All MOS	22	*71* (10)	71 (11)	72 (08)	70 (12)	70 (17)	69 (16)
SK-Total	Batch A	11	*75* (04)	76 (04)	76 (04)	76 (04)	76 (04)	76 (04)
	All MOS	22	*73* (09)	74 (09)	74 (08)	73 (11)	72 (17)	72 (14)

Note: Adjusted for shrinkage (Rozeboom formula 8). Numbers in parentheses are standard deviations. Numbers in brackets are the numbers of predictor scores entering prediction equations. Correlations for MOS-appropriate Aptitude Area composites alone are in italics. Underlined numbers denote multiple Rs greater than for Aptitude Area composites alone. Decimals omitted.

[a] ETS = Effort and Technical Skill; MPD = Maintaining Personal Discipline; PFB = Physical Fitness and Military Bearing; LEAD = Leadership Potential; SK = School Knowledge.

[b] Number of MOS for which validities were computed.

[c] AA = ASVAB MOS-appropriate Aptitude Area composites.

Table 3.15

Mean of Incremental Correlations Over ASVAB Subtests Computed Within-Job for End-of-Training Sample for Spatial, Computer, JOB, ABLE Composites, and AVOICE: Results Uncorrected for Range Restriction

Criterion[a]	MOS	No. of MOS[b]	A9 ASVAB Subtests [9]	A9+ Spatial [10]	A9+ Computer [17]	A9+ JOB [12]	A9+ ABLE Comp. [16]	A9+ AVOICE [17]
Peer-ETS	Batch A	11	*23* (05)	24 (05)	23 (07)	22 (07)	27 (06)	21 (08)
	All MOS	22	*20* (10)	21 (10)	18 (11)	19 (10)	23 (12)	18 (11)
Peer-MPD	Batch A	11	*14* (08)	14 (08)	12 (09)	14 (08)	28 (04)	13 (08)
	All MOS	22	*10* (09)	10 (09)	08 (09)	09 (09)	22 (11)	08 (09)
Peer-PFB	Batch A	11	*12* (07)	11 (07)	12 (07)	11 (0[illegible]	28 (11)	12 (09)
	All MOS	22	*08* (08)	07 (08)	09 (10)	10 (1[illegible]	23 (13)	08 (09)
Peer-LEAD	Batch A	11	*15* (06)	15 (06)	16 (07)	16 (07)	24 (07)	17 (08)
	All MOS	22	*12* (08)	13 (09)	11 (10)	13 (09)	19 (10)	12 (09)
Supv-ETS	Batch A	11	*06* (06)	07 (06)	07 (08)	06 (07)	08 (09)	06 (08)
	All MOS	22	*07* (08)	08 (08)	05 (07)	06 (08)	11 (12)	05 (07)
Supv-MPD	Batch A	11	*03* (05)	03 (05)	02 (04)	03 (04)	06 (07)	03 (05)
	All MOS	22	*04* (06)	03 (05)	02 (04)	03 (05)	06 (07)	02 (04)
Supv-PFB	Batch A	11	*04* (06)	04 (06)	04 (05)	04 (06)	09 (10)	05 (07)
	All MOS	22	*03* (05)	03 (05)	02 (04)	03 (06)	08 (10)	03 (06)
Supv-LEAD	Batch A	11	*05* (07)	05 (07)	05 (07)	06 (07)	10 (11)	06 (09)
	All MOS	22	*05* (06)	04 (06)	03 (06)	04 (06)	09 (10)	04 (07)
SK-Basic	Batch A	9	*47* (11)	48 (11)	47 (11)	47 (11)	47 (11)	46 (11)
	All MOS	20	*42* (11)	43 (11)	38 (18)	40 (14)	42 (13)	38 (16)
SK-Tech	Batch A	11	*59* (12)	59 (12)	59 (12)	59 (12)	59 (11)	59 (12)
	All MOS	22	*54* (17)	54 (17)	54 (16)	54 (15)	54 (14)	52 (18)
SK-Total	Batch A	11	*61* (09)	61 (09)	61 (09)	60 (09)	61 (09)	60 (09)
	All MOS	22	*55* (14)	55 (15)	55 (16)	55 (13)	56 (12)	53 (17)

Note: Adjusted for shrinkage (Rozeboom formula 8). Numbers in parentheses are standard deviations. Numbers in brackets are the numbers of predictor scores entering prediction equations. Multiple Rs for ASVAB Subtests alone are in italics. Underlined numbers denote multiple Rs greater than for ASVAB Subtests alone. Decimals omitted.

[a] ETS = Effort and Technical Skill; MPD = Maintaining Personal Discipline; PFB = Physical Fitness and Military Bearing; LEAD = Leadership Potential; SK = School Knowledge.

[b] Number of MOS for which validities were computed.

Table 3.16

Mean of Incremental Correlations Over ASVAB Factors Computed Within-Job for End-of-Training Sample for Spatial, Computer, JOB, ABLE Composites, and AVOICE: Results Corrected for Range Restriction

Criterion[a]	MOS	No. of MOS[b]	A4 ASVAB Factors [4]	A4+ Spatial [5]	A4+ Computer [12]	A4+ JOB [7]	A4+ ABLE Comp. [11]	A4+ AVOICE [12]
Peer-ETS	Batch A	11	*23* (05)	24 (06)	23 (07)	23 (07)	27 (09)	22 (07)
	All MOS	22	*23* (08)	23 (10)	19 (11)	22 (09)	26 (10)	19 (09)
Peer-MPD	Batch A	11	*15* (06)	15 (06)	13 (08)	15 (06)	28 (04)	13 (08)
	All MOS	22	*13* (08)	13 (09)	09 (09)	13 (09)	25 (09)	09 (09)
Peer-PFB	Batch A	11	*11* (08)	10 (08)	13 (07)	11 (09)	29 (11)	12 (09)
	All MOS	22	*11* (09)	10 (09)	10 (10)	12 (14)	25 (12)	10 (09)
Peer-LEAD	Batch A	11	*14* (08)	14 (08)	16 (07)	15 (08)	23 (09)	17 (08)
	All MOS	22	*16* (08)	15 (09)	12 (10)	16 (10)	21 (09)	14 (10)
Supv-ETS	Batch A	11	*09* (06)	09 (06)	07 (08)	08 (06)	10 (09)	08 (07)
	All MOS	22	*11* (10)	11 (09)	07 (08)	09 (08)	13 (11)	07 (07)
Supv-MPD	Batch A	11	*04* (06)	04 (06)	04 (04)	04 (05)	[illegible] (08)	04 (05)
	All MOS	22	*07* (09)	07 (09)	05 (10)	05 (08)	07 (08)	03 (04)
Supv-PFB	Batch A	11	*04* (05)	04 (05)	05 (05)	03 (04)	12 (03)	05 (07)
	All MOS	22	*06* (07)	06 (06)	03 (04)	04 (06)	10 (10)	03 (05)
Supv-LEAD	Batch A	11	*07* (06)	07 (06)	06 (07)	07 (06)	11 (10)	07 (08)
	All MOS	22	*06* (08)	06 (08)	04 (06)	07 (06)	11 (10)	05 (06)
SK-Basic	Batch A	9	*47* (11)	48 (11)	47 (11)	47 (11)	47 (11)	46 (11)
	All MOS	20	*43* (11)	44 (11)	40 (17)	42 (11)	43 (12)	39 (15)
SK-Tech	Batch A	11	*58* (12)	59 (12)	59 (12)	58 (12)	59 (11)	58 (12)
	All MOS	22	*55* (13)	56 (14)	55 (14)	55 (13)	56 (12)	53 (18)
SK-Total	Batch A	11	*60* (09)	61 (09)	61 (09)	60 (09)	61 (08)	60 (09)
	All MOS	22	*57* (11)	57 (12)	56 (13)	56 (1')	57 (11)	55 (14)

Note: Adjusted for shrinkage (Rozeboom formula 8). Numbers in parentheses are standard deviations. Numbers in brackets are the numbers of predictor scores entering prediction equations. Multiple Rs for ASVAB Factors alone are in italics. Underlined numbers denote multiple Rs greater than for ASVAB Factors alone. Decimals omitted.

[a] ETS = Effort and Technical Skill; MPD = Maintaining Personal Discipline; PFB = Physical Fitness and Military Bearing; LEAD = Leadership Potential; SK = School Knowledge.
[b] Number of MOS for which validities were computed.

Comparison of Multiple Correlations for Predicting Peer vs. Supervisor Rating Composites

Results of analyses designed to compare the validities of the ASVAB and Experimental Battery scores as predictors of peer and supervisor ratings are contained in Table 3.17. Recall that differences between validities associated with peer and supervisor ratings reported until now have been confounded with differences in the average number of raters per ratee for the peer and supervisor ratings. In Table 3.17, however, average multiple correlations (adjusted for shrinkage and corrected for range restriction) for the ASVAB and Experimental Battery predictors are reported for the two sets of single-rater peer rating composites (labeled in the table as P1 and P2) and the one set of single-rater supervisor rating composites (S1).

In prior analyses, trainees in MOS 13B had been split into two groups ("self-propelled" and "towed") due to differences in the School Knowledge Tests that each was administered, depending on the particular weapon with which they were trained. Because the School Knowledge scores were not required for the present comparisons, the dichotomy was dropped. Therefore, the averages in Table 3.17 are based on one fewer MOS than those in earlier tables.

Table 3.17 indicates that the results for the Peer 1 (P1) and Peer 2 (P2) rating composites are approximately the same. This is not surprising considering that both are sets of single-rater peer ratings of exactly the same set of ratees. On the other hand, the results indicate that the validities of the ASVAB and Experimental Battery scores are often much lower when used to predict the single-rater supervisor ratings (S1) than when they are used to predict either of the single-rater peer ratings.

Validity results for three different combinations of the single-rater composites are reported in Table 3.18. These combinations are: two sets of two-rater rating composites (one composed of the average of the P1 and S1 ratings [P1S1], the other composed of the average of the P1 and P2 ratings [P1P2]) and one set of three-rater composites composed of the average of the P1, P2, and S1 ratings (PPS).

These results indicate that the validities associated with the average of the two single-rater peer rating composites tend to be higher than those associated with the average of the single-rater peer and single-rater supervisor rating composites. Furthermore, the validities associated with the average of the three-rater (two peers and one supervisor) composites are generally no greater than the validities associated with the average of the two peer ratings alone.

SUMMARY AND FUTURE ANALYSES

Given the results from the validity analyses just presented, the following conclusions appear justified:

- The ASVAB has a substantial correlation with all of the end-of-training performance components.

Table 3.17

Mean of Multiple Correlations Computed Within-Job for ASVAB Factors, Spatial, Computer, JOB, ABLE Composites, and AVOICE as Predictors of Single-Rater Peer and Supervisor End-of-Training Ratings

Criterion[a]	MOS	No. of MOS[b]	ASVAB Factors [4]	Spatial [1]	Computer [8]	JOB [3]	ABLE Comp. [7]	AVOICE [8]
P1-ETS	Batch A	10	30 (08)	25 (05)	23 (10)	15 (05)	11 (08)	16 (08)
	All MOS	21	30 (14)	27 (11)	23 (14)	14 (10)	14 (13)	13 (12)
P1-MPD	Batch A	10	16 (09)	14 (06)	11 (07)	05 (05)	12 (06)	05 (06)
	All MOS	21	18 (15)	16 (11)	10 (09)	06 (10)	18 (13)	08 (12)
P1-PFB	Batch A	10	12 (08)	05 (05)	08 (08)	02 (04)	17 (09)	07 (07)
	All MOS	21	16 (15)	11 (12)	11 (15)	04 (07)	18 (16)	06 (08)
P1-LEAD	Batch A	10	22 (11)	18 (08)	17 (11)	12 (09)	15 (07)	12 (10)
	All MOS	21	24 (12)	20 (11)	16 (13)	11 (09)	14 (13)	09 (11)
P2-ETS	Batch A	10	30 (04)	25 (05)	25 (06)	17 (04)	13 (09)	15 (08)
	All MOS	21	34 (14)	28 (10)	26 (09)	17 (10)	17 (12)	19 (18)
P2-MPD	Batch A	10	17 (03)	15 (03)	12 (07)	07 (05)	13 (08)	08 (06)
	All MOS	21	20 (13)	19 (08)	11 (09)	09 (10)	14 (10)	07 (08)
P2-PFB	Batch A	10	12 (07)	05 (06)	07 (07)	03 (05)	18 (10)	06 (05)
	All MOS	21	15 (13)	10 (09)	07 (08)	03 (06)	16 (12)	07 (11)
P2-LEAD	Batch A	10	21 (09)	17 (07)	18 (11)	12 (08)	13 (11)	12 (07)
	All MOS	21	23 (14)	22 (11)	19 (14)	16 (13)	13 (11)	13 (10)
S1-ETS	Batch A	10	19 (07)	17 (05)	16 (10)	10 (08)	09 (10)	11 (10)
	All MOS	21	25 (17)	22 (13)	17 (14)	11 (11)	11 (13)	11 (10)
S1-MPD	Batch A	10	12 (06)	11 (06)	10 (06)	05 (05)	06 (06)	06 (05)
	All MOS	21	15 (16)	13 (11)	10 (13)	06 (08)	06 (08)	05 (07)
S1-PFB	Batch A	10	09 (08)	08 (04)	07 (07)	06 (05)	11 (09)	08 (07)
	All MOS	21	14 (15)	13 (12)	10 (14)	05 (07)	10 (10)	05 (07)
S1-LEAD	Batch A	10	13 (09)	13 (07)	11 (09)	08 (08)	10 (11)	07 (09)
	All MOS	21	18 (17)	17 (11)	10 (11)	10 (10)	11 (12)	06 (09)

Note: Results corrected for range restriction and adjusted for shrinkage (Rozeboom formula 8). Numbers in parentheses are standard deviations. Numbers in brackets are the numbers of predictor scores entering prediction equations. Decimals omitted.

[a] P1 ratings are from raters in Peer Group 1; P2 ratings are from raters in Peer Group 2; and S1 ratings are from raters in Supervisor Group 1.
[b] Number of MOS for which validities were computed.

Table 3.18

Mean of Multiple Correlations Computed Within-Job for ASVAB Factors, Spatial, Computer, JOB, ABLE Composites, and AVOICE as Predictors of Three Combinations of Single-Rater Peer and Supervisor End-of-Training Ratings

Criterion[a]	MOS	No. of MOS[b]	ASVAB Factors [4]	Spatial [1]	Computer [8]	JOB [3]	ABLE Comp. [7]	AVOICE [8]
P1P2-ETS	Batch A	10	37 (07)	30 (05)	31 (07)	20 (05)	16 (10)	21 (09)
	All MOS	21	39 (12)	34 (10)	31 (11)	19 (10)	21 (14)	21 (15)
P1P2-MPD	Batch A	10	21 (04)	18 (04)	14 (07)	07 (06)	18 (06)	09 (07)
	All MOS	21	22 (13)	19 (09)	12 (09)	09 (11)	21 (11)	08 (12)
P1P2-PFB	Batch A	10	14 (09)	06 (05)	09 (09)	04 (05)	24 (08)	07 (07)
	All MOS	21	17 (14)	09 (12)	11 (12)	05 (08)	23 (11)	09 (11)
P1P2-LEAD	Batch A	10	26 (11)	21 (08)	23 (11)	15 (10)	17 (11)	16 (10)
	All MOS	21	26 (16)	24 (11)	22 (16)	16 (12)	18 (14)	16 (14)
P1S1-ETS	Batch A	10	32 (06)	27 (03)	27 (07)	15 (03)	11 (12)	16 (12)
	All MOS	21	36 (15)	30 (13)	28 (15)	16 (11)	16 (15)	16 (13)
P1S1-MPD	Batch A	10	19 (05)	16 (05)	12 (09)	06 (07)	11 (08)	09 (06)
	All MOS	21	22 (11)	17 (09)	11 (12)	07 (12)	15 (11)	08 (08)
P1S1-PFB	Batch A	10	13 (08)	07 (04)	10 (06)	05 (05)	20 (09)	08 (07)
	All MOS	21	17 (17)	13 (13)	14 (16)	06 (06)	21 (12)	07 (08)
P1S1-LEAD	Batch A	10	23 (10)	19 (07)	19 (11)	13 (09)	17 (09)	13 (11)
	All MOS	21	27 (12)	23 (11)	18 (13)	14 (10)	17 (13)	12 (11)
PPS-ETS	Batch A	10	37 (05)	31 (03)	32 (06)	20 (07)	16 (11)	19 (13)
	All MOS	21	42 (14)	35 (10)	33 (11)	20 (11)	22 (13)	21 (15)
PPS-MPD	Batch A	10	22 (04)	19 (04)	16 (09)	08 (06)	15 (08)	11 (08)
	All MOS	21	24 (13)	20 (08)	14 (11)	09 (12)	18 (10)	09 (10)
PPS-PFB	Batch A	10	13 (09)	07 (05)	11 (07)	05 (05)	25 (07)	09 (08)
	All MOS	21	18 (16)	11 (13)	15 (13)	05 (07)	24 (10)	09 (10)
PPS-LEAD	Batch A	10	27 (09)	22 (07)	23 (10)	15 (09)	19 (10)	16 (11)
	All MOS	21	29 (14)	25 (12)	22 (15)	18 (12)	19 (13)	14 (13)

Note: Results corrected for range restriction and adjusted for shrinkage (Rozeboom formula 8). Numbers in parentheses are standard deviations. Numbers in brackets are the numbers of predictor scores entering prediction equations. Decimals omitted.

[a] P1P2 ratings are averages of ratings from raters in Peer Groups 1 and 2; P1S1 ratings are averages of ratings from raters in Peer Group 1 and Supervisor Group 1; and PPS ratings are averages of ratings from raters in Peer Group 1, Peer Group 2, and Supervisor Group 1.

[b] Number of MOS for which validities were computed.

- The multiple correlations between the ASVAB and the School Knowledge Test scores were quite high. The "complete" forms of the ASVAB (i.e., the nine ASVAB subtests and the four ASVAB factor composite scores) performed a little better than the "reduced" forms (i.e., the AFQT and the AA composite scores).

- The ABLE factor scores based on 114 items predicted the end-of-training performance measures slightly better than both the rationally constructed ABLE composites and the factor scores based on 168 items.

- For the most part, little incremental validity was found for the Experimental Battery over the ASVAB with respect to the School Knowledge tests. Note, however, that the ASVAB baseline multiple correlations for the School Knowledge tests are very high, making it difficult to improve upon them.

  On the other hand, more substantial incremental validity was obtained for predicting the end-of-training ratings. Most of this increment was attributable to the ABLE when regressed against the average peer ratings. These increments ranged from 2 to over 20 points, depending on the particular rating composite and ASVAB scores used.

  In addition, more incremental validity was observed when the "reduced" ASVAB scores served as the baseline, but this was due primarily to the lower multiple correlations of these ASVAB scores with the criterion measures.

- As expected, comparison of results corrected and uncorrected for multivariate range restriction suggests that the same patterns of correlations are obtained in both situations. With regard to the effect of the correction on the incremental validity of the Experimental Battery over the various ASVAB scores, the correction yields <u>conservative</u> estimates of the incremental validity obtained when predicting the end-of-training criterion measures.

- Better prediction is obtained for the peer ratings than for the supervisor ratings, even when one controls for the effects of the number of raters per ratee. This is consistent with the prior analysis of the EOT performance measures themselves, which demonstrated a greater degree of construct validity for the peer ratings than for the supervisor ratings. The most reasonable explanation is the greater opportunity for peers to observe the relevant components of performance.

Future validation analyses using the end-of-training criteria will focus on the degree to which prediction equations generalize across MOS for specific criteria, and the degree to which the equations generalize across criteria within an MOS. That is, these analyses will investigate whether these prediction situations require MOS-specific or criterion-specific regression equations, or whether a single regression equation is sufficient for the purpose.

Chapter 4
DEVELOPMENT OF BASIC SCORES FOR THE LVI PERFORMANCE MEASURES

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In 1988 and 1989, first-tour criterion measures were administered to the Longitudinal Validation sample (LVI). This data collection was conducted concurrently with the administration of second-tour criterion measures to the Concurrent Validation sample (CVII). Before we could begin LVI performance model development and subsequent validation analyses, it was necessary to derive basic scores for each of the individual first-tour job performance measures. Table 4.1 lists the individual measures that were administered.

This chapter will describe the procedures that were used to develop the basic scores for each measure, present the results of the score development analysis, and portray the final array of basic scores that were used in all subsequent analyses of the LVI data. Again, the major reason for the basic score analysis is that dealing with all the individual scores from each task test, each rating scale, and each administrative index is simply not feasible or desirable. There are too many of them, there is much redundancy, and the reliabilities of the individual items or scales preserve too much measurement error with very little gain in total information.

Table 4.1

Performance Measures Administered to Soldiers in LVI Sample

MOS in Batch A:	Background Information Form
	Job Knowledge Tests
	Hands-on Tests
	Army-Wide Rating Scales
	MOS-Specific Rating Scales
	Combat Performance Prediction Scales (males only)
	Personnel File Form
	Army Job Satisfaction Questionnaire
	Job History Questionnaire
	Physical Requirements Survey
MOS in Batch Z:	Background Information Form
	School Knowledge Test
	Army-Wide Rating Scales
	Combat Performance Prediction Scales (males only)
	Personnel File Form
	Army Job Satisfaction Questionnaire
	Physical Requirements Survey

Note. Rating scale data were collected from both supervisors and peers. The Physical Requirements Survey is not a Career Force or Project A measure.

Before score development for each measure is discussed in turn, the general characteristics of the measures, the LVI data collection procedure, and the final samples that were obtained will be described. The basic data editing and imputation procedures used to generate the final data set that was used in the performance modeling and validation analyses will be described in the next chapter.

Because the LVI measures did not differ greatly from the CVI instruments, the procedures used to compute basic scores for the LVI criterion measures were quite similar to those used to score the CVI criterion measures. The differences that do exist between the measures administered in CVI and those administered in LVI are summarized below.

DIFFERENCES BETWEEN CVI AND LVI PERFORMANCE MEASURES[1]

The three-year time period between CVI and LVI raised the issue that some criterion content might have become outdated. Equipment and/or procedural changes would require test revisions, and changes in MOS responsibilities had the potential of making some tasks obsolete.

Project staff identified relevant changes so that the appropriate revisions could be made. In a few cases where an entire task was obsolete, the task was dropped without replacement. In many cases, revisions were simply a matter of replacing outdated terminology. Updated criterion measures were forwarded to the MOS proponents for a currency review and additional revisions were made on the basis of this review.

The time period between the two data collections was particularly significant for the 19E (M60 Armor Crewman) MOS because this MOS was being severely reduced as the 19K (M1 Armor Crewman) MOS was being phased in. To deal with this equipment/MOS transition, a job analysis of 19K was conducted and a complete set of criterion measures was developed for this MOS. The same procedures used for the other MOS (Campbell, 1987b) were followed, with one exception. The 19K MOS-specific rating scales were developed by SMEs from the Armor School and by 19E NCOs. Because of the 19E/K split, the LVI data collection included 10 MOS in Batch A rather than nine, as in Project A earlier work.

Lessons learned from CVI prompted the use of a different format for the hands-on test sheets. Additionally, an overall effectiveness rating for performance of each task (on a scale of 1 to 7) was added to the end of each task score sheet in the expectation that it would provide unique task performance information.

After a search for additional first-tour measures that would have direct relevance to the issue of combat readiness, a computer-simulated M16 rifle marksmanship task was selected for administration to MOS 11B and 95B soldiers for one of the tasks they had selected for testing, Engage Targets With an M16. The Multipurpose Arcade Combat Simulator (MACS) was originally developed for use as a training aid. Using a demilitarized M16 rifle, the

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[1] The text of this section is adapted from the Project A Final Report (ARI Research Report 1597) edited by Campbell and Zook (1991).

soldier "shoots" at a series of 30 targets displayed on a computer monitor, some moving and some stationary. Attached to the barrel of the rifle is a light pen which simulates the path of the rounds.

While there was considerable interest in keeping the Combat Performance Prediction Scales, project staff and the Scientific Advisory Group agreed that the version used in CVI was too lengthy. Two alternatives were considered. The first option was simply to reduce the number of items in the original summated rating scale. The second option was to reduce the specific behavioral items to summary dimensions. Three dimensions were derived through empirical and rational analysis, and the new scales were field tested in conjunction with the second-tour criterion measure field tests. Low reliability estimates for the dimensional ratings led to the decision to retain the original summated scale format, but the total number of items was reduced from 40 to 19.

The final set of Combat Performance Prediction Scale items was selected by considering interrater reliability, internal consistency, and content coverage. That is, an item was dropped if its content was covered in another item whose estimated reliability was higher, or if its content was specifically technical in nature (and thus more appropriately covered by the other criterion measures). Three of the original items were deleted because SMEs (senior NCOs with combat or tactical field experience) indicated that they were not meaningful. Another change from the CVI version of the scales was to use a less cumbersome 7-point scale instead of a 15-point scale. Finally, it was decided that Combat Performance Prediction Scale ratings would not be collected on female soldiers since, by policy, women are excluded from participation in combat situations. (Note that this decision was reversed for the LVII data collection, following the central involvement of female soldiers in Operations Just Cause and Desert Storm.)

The self-report form for gathering information on administration records was updated by reviewing its contents with officers and NCOs representing the Army Personnel Command (PERSCOM). The form was altered to allow soldiers to report an M19 qualification in the event that an M16 qualification is not applicable. Also, three awards were dropped per guidance from PERSCOM.

Task-level ratings were deleted from the array of Batch A first-tour criterion measures used in CVI. The deletion included MOS-specific tasks that had appeared in the MOS-specific rating scales and common soldiering tasks that had appeared in the Army-wide rating scales. The task ratings were eliminated because they were not sufficiently reliable.

Two non-criterion measures that had been administered in CVI were also dropped from the LVI administration. The deleted instruments were the Measurement Method Rating, which allowed soldiers to rate the fairness of each measurement method used, and the Army Work Environment Questionnaire.

A new measure developed by the ARI staff was the Army Job Satisfaction Questionnaire (AJSQ). It was designed to provide information that would be potentially useful for predicting attrition and for understanding the relationship of job satisfaction with other constructs investigated within this research project. Development procedures are described in Campbell and Zook (1990). The AJSQ was administered to both first- and second-tour soldiers. The derivation of a scoring scheme and associated descriptive data

analyses for these LVI/CVII data are provided in the first annual report for Career Force, and will not be presented further here.

LVI SAMPLE DESCRIPTION

Soldiers from 22 MOS were included in the administration of first-tour criterion measures in 1988 and 1989. These MOS are listed in Table 4.2. The Batch A MOS are the same as those studied in the Concurrent Validation, except for the addition of 19K (M1 Armor Crewman). This MOS was added to the research in response to the planned phasing out of 19E (M60 Armor Crewman). The Batch Z MOS differ from those examined in the Concurrent Validation in that two MOS, 29E and 96B, were added to broaden coverage of job types and one MOS (76W) was dropped because it was highly redundant with another (76Y).

Table 4.2

MOS in Longitudinal Validation Sample

	Batch A		Batch Z
11B	Infantryman	12B	Combat Engineer
13B	Cannon Crewman	16S	MANPADS Crewman
19E	M60 Armor Crewman	27E	Tow/Dragon Repairer
19K	M1 Armor Crewman	29E	Electronics Repairer
31C	Single Channel Radio Operator	51B	Carpentry/Masonry Specialist
63B	Light-Wheel Vehicle Mechanic	54B	NBC Specialist
71L	Administrative Specialist	55B	Ammunition Specialist
88M	Motor Transport Operator	67N	Utility Helicoptor Repairer
91A	Medical Specialist	76Y	Unit Supply Specialist
95B	Military Police	94B	Food Service Specialist
		96B	Intelligence Analyst

As in CVI, the Batch A MOS differed from the Batch Z MOS in the comprehensiveness of the MOS-specific criterion measures that were available for administration. MOS-specific rating scales, hands-on tests, and job knowledge tests were administered to Batch A soldiers. The only MOS-specific measure available for administration to the Batch Z soldiers was the school knowledge test that had been developed for administration at the end of training. The school knowledge test was administered to the Batch Z examinees as a surrogate for a job knowledge test.

Data Collection Strategy

The LVI data collection strategy has been described elsewhere (Campbell & Zook, 1990), but will be briefly reviewed here. Project staff were sent to 13 Army installations throughout the continental United States and to several sites throughout Germany to collect first-tour job performance data. The duration of each test site visit averaged about four weeks, and the data collection spanned July 1988 through February 1989.

Considerable advance coordination was necessary to ensure that each test site was prepared to accommodate the data collection. In addition to provision of facilities and equipment, examinees and their supervisors had to be identified and scheduled for participation. As it turned out, the tracking, scheduling, and testing of soldiers who had been tested on the Project A predictors at entry proved to be extremely challenging. Indeed, to ensure that sufficient numbers of soldiers were tested during the course of the data collection, it was decided that "supplemental" soldiers would have to be tested as well. Supplemental examinees are defined as soldiers who entered the Army within the same Basic Active Service Date window as "target" soldiers (i.e., between 20 Aug 86 and 20 Nov 87), but from whom no Project A predictor data had been collected.

Generally, each test site team was composed of a Test Site Manager, two Hands-On Managers, two Hands-On Assistants, and five test administrators. Additionally, the Army installations provided eight NCOs per Batch A MOS to administer and score the hands-on tests. Project staff comprising the data collection teams were provided with both formal and informal training related to their data collection responsibilities.

The written test component (e.g., job knowledge or school knowledge test, peer ratings) required one-half day to administer and the hands-on component required another one-half day. Thus, Batch A soldiers participated for one full day whereas Batch Z soldiers participated for only one-half day each.

Sample Sizes

Table 4.3 summarizes sample sizes by MOS and by the amount of prior data that are available for the LVI examinees. As mentioned above, some soldiers tested in LVI had not previously participated in Project A testing. The data provided by these soldiers are useful for performance modeling purposes and to validate ASVAB, but validation analyses related to the Experimental Battery or the end-of-training measures cannot be performed with their data.

Out of the 11,266 soldiers tested in LVI, 23 percent had not been tested previously as part of this research program. These are the so-called "supplemental" examinees. The percentage of examinees that are supplemental varies considerably across MOS. The worst case is with MOS 19E, in which 63 percent of the examinees had not been tested on either the Experimental Battery or end-of-training tests. This was probably due to factors associated with the phasing out of this MOS. The best case is with MOS 11B, in which only 5 percent of the soldiers tested did not have Experimental Battery and/or training data.

It is also interesting to note that, while most MOS had a trivial number of examinees who had been tested previously only at the end of training (in contrast to at entry), some MOS had a relatively large number of such examinees. In particular, over one-quarter of the 27E, 29E, and 31C examinees fit this category.

The data analyses reported in this chapter for score development are based on data from the entire LVI sample, regardless of the amounts of predictor or training data that are available for the examinees. Analyses reported in other chapters (e.g., Chapter 7), however, may be based on subsets of these examinees depending on the type of variables that are required for the analysis. Also, the data files used to develop the basic scores for each

measure were subjected only to the preliminary editing described by each investigator. The score development analyses were conducted only on cases with complete data. The data files that were later used for the modeling and validation analyses were subjected to the final editing and missing data imputation procedures described in the next chapter. This chapter sequence is necessary because the imputation procedures were applied at the basic score level for some instruments.

Table 4.3

LVI Sample Sizes by Amount of Prior Data

MOS	Predictor End-of-Training	Predictor Only	End-of-Training Only	No Prior Data	Total
11B	701 77.12	111 12.21	48 5.28	49 5.39	909 8.07[b]
12B	585 69.56	11 1.31	13 1.55	232 27.59	841 7.46
13B	773 84.39	15 1.64	13 1.42	115 12.55	916 8.13
16S	270 57.20	62 13.14	23 4.87	117 24.79	472 4.19
19E	60 24.10	29 11.65	3 1.20	157 63.05	249 2.21
19K	568 68.93	24 2.91	7 0.85	225 27.31	824 7.31
27E	37 41.11	7 7.78	28 31.11	18 20.00	90 .80
29E	44 39.29	21 18.75	29 25.89	18 16.07	112 .99
31C	154 29.11	94 17.77	144 27.22	137 25.90	529 4.70
51B	86 40.38	11 5.16	5 2.35	111 52.11	213 1.89
54B	251 50.30	108 21.64	19 3.81	121 24.25	499 4.43
55B	138 49.46	11 3.94	58 20.79	72 25.81	279 2.48
63B	307 40.82	263 34.97	20 2.66	162 21.54	752 6.67

(Continued)

Table 4.3 (Continued)

LVI Sample Sizes by Amount of Prior Data

MOS	Predictor End-of-Training	Predictor Only	End-of-Training Only	No Prior Data	Total
67N	59 29.95	24 12.18	34 17.26	80 40.61	197 1.75
71L	291 42.92	66 9.73	46 6.78	275 40.56	678 6.02
76Y	456 57.87	192 24.37	27 3.43	113 14.34	788 6.99
88M	282 41.35	31 4.55	108 15.84	261 38.27	682 6.05
91A	582 70.63	88 10.68	71 8.62	83 10.07	824 7.31
94B	399 47.96	305 36.66	22 2.64	106 12.74	832 7.39
95B	292 64.60	28 6.19	2 0.44	130 28.76	452 4.01
96B	66 51.56	31 24.22	10 7.81	21 16.41	128 1.14
Total N Percent	6,401 56.82	1,532 13.60	730 6.48	2,603 23.10	11,266 100.00

[a] Row percentage
[b] Column percentage

SCORE DEVELOPMENT FOR ADMINISTRATIVE INDICES

Five scores were computed from the CVI Personnel File Form: (a) awards and memoranda/certificates of achievement, (b) Physical Readiness Test, (c) M16 qualification, (d) Articles 15 and flag actions, and (e) promotion rate. Since these scores captured all of the information collected on the form (except for the Skill Qualification Test score), there was little reason to change their composition for LVI purposes. Some changes, however, were made to the way in which variables had been combined to form the composites in the CVI analyses. Each of the five first-tour Personnel File Form scores is discussed in turn below.

The first score from the Personnel File Form is a composite of several items that reflect recognition of exceptional job performance. These are

(a) awards and decorations; (b) memoranda of appreciation, commendation, or achievement; and (c) certificates of appreciation, commendation, or achievement. Soldiers receive promotion board credit for these honors. Within the promotion board system, the Army weights awards and decorations depending upon the relative significance of the various honors. Whereas all awards and decorations were weighted equally in the CVI scoring system, the LVI scoring system weighted these honors according to the weighting system incorporated into the promotion process. Project staff believed that the non-unit weighting scheme would more appropriately reflect the degree of exceptional performance exhibited by the soldiers in our sample. Note that this weighting strategy was also used with the CVII version of the Personnel File Form.

In another variation from the CVI scoring system, the composite "positive recognition" score was a simple sum of the three basic scores (i.e., awards, memoranda, and certificates). An examination of the distribution of basic scores indicated that there was no compelling reason to standardize the scores before combining them to produce the composite. Although the CVI scoring system standardized the basic scores, the summing of raw scores was considered to be more parsimonious, and thus preferable for use in LVI.

The next two scores from the Personnel File Form are the result of routine tests periodically administered by the Army. The first is the Physical Readiness Test score. Soldiers generally take this test on an annual basis. The test requires the soldier to perform sit-ups, push-ups, and a 2-mile run. The M16 qualification is used to classify soldiers into three skill levels of rifle firing ability. A reasonably large number of soldiers are assigned the M19 instead of the M16, which is why the M19 was added to the LVI Personnel File Form. No distinction was made between these weapon types in scoring.

Articles 15 and flag actions reflect disciplinary problems. In CVI, the frequency of each type of action was standardized prior to summing to compute the disciplinary action composite score. As with the "positive recognition" composite score described above, it was determined that the distribution of scores for the Articles 15 and flag actions was not different enough to warrant standardization prior to summing.

The last score, promotion rate, does not actually come from information collected on the Personnel File Form. Rather, this variable is derived from data available in the Army's computerized personnel records. It is the residual of pay grade regressed on time in service, adjusted by MOS.

Descriptive statistics for each of the five composite variables are shown in Table 4.4. All of the composite scores except promotion rate are computed in the same manner as the corresponding scores on the CVII version of the Personnel File Form.

As one would expect, second-tour soldiers had more awards/memoranda/certificates than first-tour soldiers (an average of 10.5 compared to 3). Their average Physical Readiness Test score was also somewhat higher (250 compared to 238). The M16/M19 Qualification score was only slightly higher for second-tour soldiers (2.5 versus 2.2). Somewhat surprisingly, second-tour soldiers appeared to get as many disciplinary actions in the second tour as first-tour soldiers were getting in the first tour (.42 compared to .40).

Table 4.4

LVI Personnel File Form Descriptive Statistics

Composite Variable	Mean	SD	N	Minimum	Maximum
Awards/Memos/Certificates	3.29	3.18	10,894	0	21
Physical Readiness	238.30	32.75	10,389	19	300
M16/M19 Qualification	2.21	.76	10,735	1	3
Articles 15/Flag Actions	.40	.88	11,095	0	8
Promotion Rate	1.97	.59	10,915	-2.85	2.16

SCORE DEVELOPMENT FOR COMBAT PERFORMANCE PREDICTION RATING SCALES

Ratings on the Combat Performance Prediction Scales were analyzed to determine the preferred method for scoring this instrument. Given that a scoring system for the second-tour version of these scales had already been devised, and that the same items would be scored on both the first-tour and second-tour versions of the scales, it was decided that the second-tour scoring system would be used unless characteristics of the first-tour data suggested that this would be inappropriate. This scoring system combined supervisor and peer ratings, and produced a single score by totaling averaged ratings across the 14 scored items. This differed from the CVI scoring system, which combined supervisor and peer ratings, and summed items to produce two scores, "Performing Under Adverse Conditions" and "Avoiding Mistakes."

Supervisor ratings were collected for 8,713 first-tour soldiers and peer ratings were collected for 8,153. (Recall that all soldiers rated on these scales were male.) A total of 91 percent of the soldiers had ratings from at least one supervisor and 68 percent had ratings from two or more supervisors. Peer ratings were not as complete, with 85 percent of the soldiers having ratings from at least one peer and 55 percent having ratings from two or more peers.

Principal components analyses of the second-tour Combat Scale data indicated the presence of two factors. The second factor, however, was defined by the three negatively worded items on the rating scale. Results were virtually identical with the analysis of the first-tour data. Given that, in both cases, the second factor is probably not substantively distinct from the first, the calculation of a single total score (with the negatively worded items reverse-scored) for the Combat Scale ratings appeared appropriate for both first- and second-tour ratings. Note that the two factors found in the LVI/CVII data are essentially the same as those which were found in CVI, and used to derive the two Combat Scale scores at that time.

Interrater reliability estimates are reported in Table 4.5. These estimates are higher than those obtained with the second-tour ratings because

there tended to be more ratings for each first-tour examinee. Coefficient alphas were virtually identical for ratings of first- and second-tour soldiers. Supervisor ratings yielded a coefficient of .930, peer ratings yielded a coefficient of .906, and the combined ratings exhibited an alpha coefficient of .934.

Given these results, the decision was made to score the Combat Performance Prediction Scales in the same manner for both CVII and LVI. That is, only one score was computed, and it was calculated by summing the combined supervisor and peer ratings across all items. It is worth noting that the mean Combat Scale score was appreciably higher for second-tour soldiers (mean = 70; SD = 11) than for first-tour soldiers (mean = 63; SD = 11).

Table 4.5

LVI Combat Scales Interrater Reliability Estimates

	1-Rater Reliability	N-Rater Reliability
Supervisor Ratings	.399	.543
Peer Ratings	.247	.478
Combined Ratings	.279	.607

DEVELOPMENT OF BASIC SCORES FOR THE FIRST-TOUR PERFORMANCE RATING SCALES

This section reports results of the analyses of first-tour performance rating data for the Longitudinal Validation (LVI) sample. There were two major objectives: (a) to evaluate the psychometric properties of the ratings to ensure that they were of high quality, and (b) to identify a set of rating scale composites (basic scores) that would appropriately reflect the major dimensions of content in the performance ratings.

As reported previously (Campbell, 1987; Pulakos & Borman, 1986; Toquam et al., 1986), Army-wide and MOS-specific first-tour performance rating scales were developed for use by supervisors and peers of first-tour soldiers to evaluate these soldiers on the important dimensions of performance. In particular, the behaviorally anchored rating scale (BARS) method (Campbell, Dunnette, Arvey, & Hellervik, 1973) was used to identify soldier effectiveness dimensions and to develop behavioral definitions of performance for each dimension. The Army-wide rating scales include 12 dimensions of soldier effectiveness that are important regardless of soldiers' MOS. MOS-specific rating scales were developed for each of the nine Batch A MOS, and these rating scales include between 7 and 13 dimensions of MOS-specific performance.

The Army-wide and MOS-specific rating scales were used previously, as part of the Concurrent Validation study, to obtain job performance information for a sample of 8,642 first-tour soldiers (referred to as the CVI sample) from their peers and supervisors. Analyses of these data (Pulakos & Borman, 1987) showed that the ratings obtained had appropriate distributions and satisfactory reliability, and factor analyses revealed three interpretable

underlying dimensions of job performance. Discussion of the present data analyses will compare these CVI results with those obtained for the LVI sample.

Sample Description

We attempted to obtain multiple peer and supervisor ratings for each individual in the LVI target sample, which consisted of 6,602 first-tour soldiers from Batch A MOS and 4,311 first-tour soldiers from Batch Z MOS. Data collection administrators and the Army Points-of-Contact identified and contacted supervisors and peers of the target sample members. Peer ratings were generally obtained only when peers of the ratees were also members of the target sample. In a few cases, when no supervisor ratings could be obtained, peers who were not members of the target sample were brought in to make ratings. Supervisor and peer rating sessions were usually conducted separately.

Tables 4.6 and 4.7 show, by MOS, the actual numbers of supervisor and peer raters who provided ratings for each member of the target sample for Batch A and Z respectively. As shown by Table 4.6, across all Batch A MOS, more than 80 percent of the target sample had at least one peer rating (5,450 of 6,602) and more than 90 percent of the target sample had at least one supervisor rating (6,022 of 6,602). Those Batch A ratees who had at least one peer rating, there were an average of 2.82 peers per ratee. For those who received supervisory ratings, an average of 1.83 supervisors per ratee provided ratings. Table 4.7 shows that, across all Batch Z MOS, more than 85 percent of the target sample obtained at least one peer rating (3,672 of 4,311); more than 90 percent of the target sample obtained at least one supervisor rating (3,903 of 4,311). Those Batch Z ratees who had any peer ratings at all had an average of 2.93 peers per ratee. For those who received supervisory ratings, there were an average of 1.82 supervisors per ratee.

An extremely important aspect of each rating session was a rater orientation and training program developed to reduce various rating errors (e.g., halo) and to persuade raters to provide evaluations that are as accurate as possible. The orientation/training program was an adaptation of the program developed for raters participating in the Concurrent Validation first-tour data collection (Pulakos & Borman, 1986).

Data Analyses

Before the basic data analyses were conducted on the Army-wide and MOS-specific ratings, preliminary analyses assessed the quality of the obtained ratings and explored the possibility of screening out poor-quality data. For each rater who had rated at least two soldiers common to other raters, a measure of the proximity of their ratings to those made by other raters was computed. (Ratees were included in this analysis only if they had been rated by at least two persons.) It was expected that raters who had made their ratings carelessly or incorrectly would provide ratings that were, on average, quite dissimilar to those provided by others who had rated the same soldiers. This proximity measure represents the average discrepancy between ratings made by a particular rater and those made by all other persons who had rated the same soldiers. Calculating the proximity measure involved computing, for each rater and for each dimension, the absolute difference between the dimension

Table 4.6

LVI Army-Wide Ratings: Number of Peer and Supervisor Ratings per Ratee by MOS, Batch A

	MOS										Total Sample
	11B	13B	19E	19K	31C	63B	71L	88M	91A	95B	
PEERS											
Number of Ratings											
0	69	74	6	141	163	192	300	86	102	19	1152
1	110	120	37	95	114	213	168	87	115	37	1096
2	242	178	79	111	103	164	108	132	141	58	1316
3	210	241	77	141	47	99	31	122	164	110	1242
4	190	191	34	171	57	50	25	176	187	182	1263
5	58	67	5	88	12	9	2	46	70	38	395
6	18	17	3	27	1	1	0	16	17	6	106
7	2	6	0	4	0	0	0	0	9	1	22
8	0	3	0	2	0	0	0	1	2	0	8
9	0	0	0	2	0	0	0	0	0	0	2
LVI Sample Total N	899	897	241	782	497	728	634	666	807	451	6602
Mean Number of Ratings per Ratee											
Total LVI Sample	2.67	2.75	2.51	2.67	1.52	1.50	.93	2.64	2.69	3.20	2.33
Rated Persons	2.89	3.00	2.57	3.26	2.26	2.03	1.76	3.03	3.08	3.34	2.82
SUPERVISORS											
Number of Ratings											
0	66	98	15	146	61	45	38	35	58	18	580
1	141	176	47	164	137	236	218	127	237	89	1572
2	608	564	154	350	277	423	356	473	492	323	4020
3	76	45	21	44	21	22	19	30	17	20	315
4	6	9	3	76	1	2	3	1	3	1	105
5	1	5	1	2	0	0	0	0	0	0	9
6	1	0	0	0	0	0	0	0	0	0	1
Mean Number of Ratings per Ratee											
Total LVI Sample	1.80	1.67	1.80	1.68	1.53	1.59	1.58	1.75	1.59	1.77	1.67
Rated Persons	1.94	1.88	1.92	2.06	2.26	1.69	1.68	1.85	1.71	1.85	1.83

Table 4.7

LVI Army-Wide Ratings: Number of Peer and Supervisor Ratings per Ratee by MOS, Batch Z

	MOS											Total Sample
	12B	16S	27E	29E	51B	54B	55B	67N	76Y	94B	96B	
PEERS												
Number of Ratings												
0	42	9	15	26	19	52	23	15	311	81	46	639
1	106	38	17	43	32	46	31	26	205	157	37	738
2	177	58	19	14	45	56	46	43	121	189	22	790
3	218	96	14	18	52	116	71	38	63	177	11	874
4	195	154	14	4	31	118	55	49	26	125	3	774
5	64	80	5	1	11	67	29	16	6	64	3	346
6	16	26	2	3	19	10	5	2	15	0	0	98
7	8	6	0	0	0	12	4	1	0	5	0	36
8	0	1	1	0	0	4	0	0	0	3	0	9
9	1	0	1	0	0	2	0	0	0	1	0	5
10	0	0	0	0	0	0	0	0	0	1	0	1
11	0	0	1	0	0	0	0	0	0	0	0	1
LVI Sample Total N	827	468	89	106	193	492	269	193	734	818	122	4311
Mean Number of Ratings per Ratee												
Total LVI Sample	2.87	3.56	2.45	1.38	2.46	3.17	2.93	2.79	1.07	2.51	1.16	2.49
Rated Persons	3.03	3.63	2.95	1.83	2.73	3.55	3.21	3.03	1.85	2.79	1.86	2.93
SUPERVISORS												
Number of Ratings												
0	71	45	6	6	19	30	25	20	72	97	17	408
1	204	109	5	31	32	122	50	57	247	212	26	1095
2	517	279	76	62	45	312	184	110	396	456	72	2509
3	33	30	2	4	52	23	8	4	17	43	7	223
4	2	4	0	3	31	5	2	1	1	7	0	56
5	0	0	0	0	11	0	0	1	1	3	0	16
6	0	1	0	0	3	0	0	0	0	0	0	4
Mean Number of Ratings per Ratee												
Total LVI Sample	1.62	1.66	1.83	1.69	1.71	1.70	1.67	1.54	1.50	1.58	1.57	1.65
Rated Persons	1.78	1.84	1.96	1.79	1.76	1.81	1.84	1.72	1.66	1.80	1.82	1.82

rating made by that particular rater and the mean dimension rating made by all others who had rated that particular ratee. The proximity measure for a particular rater was then simply the mean of these absolute differences across all dimensions and all ratees.

Next, for both Army-wide and MOS-specific performance rating scales, analyses were conducted focusing on the distributions of the ratings (e.g., means and standard deviations) and interrater reliabilities. Analyses for the Army-wide ratings were carried out on the total sample (including all Batch A and Batch Z soldiers); MOS-specific ratings were of course analyzed separately by MOS (for Batch A soldiers only).

Principal factor analyses with varimax rotation were conducted on the Army-wide ratings (across all MOS), for supervisor and peer ratings separately *and* pooled together. The pooled ratings were computed by averaging the mean peer rating and the mean supervisor rating for those soldiers who had at least one peer rating and one supervisor rating. Because previous analyses (using the CVI sample) showed that a single factor was sufficient to account for the majority of the variance in the MOS-specific ratings, factor analyses were not conducted for the MOS-specific rating data.

Results

Data Quality Screening

Over 68 percent of the raters for whom the proximity measure screen was computed obtained scores of 1.2 or less on this screen. This indicates that the mean absolute difference between the ratings made by these raters and those made by other raters was 1.2 or less on a 7-point scale. For more than 98 percent of the raters the mean absolute difference score was 2.0 or less.

It was decided not to screen out data based on raters' scores on this proximity measure for three reasons. First, the fact that most raters obtained relatively low scores on this measure shows that in general the data are of very high quality. Second, if a relatively high cut score was selected (e.g., screen out those scoring 2.0 or higher on the proximity measure), very little data would be screened out, and the screening would have little impact on the results of the remaining data analyses. Third, it was not clear what a reasonable cut score would be on this type of screening measure.

Army-Wide Rating Scales

For the Army-wide ratings, data are first presented on the rating distributions. Second, interrater reliability results are shown; and finally, factor analysis results are summarized.

Rating distributions. Table 4.8 displays the Army-wide rating distributions, showing the scale points utilized by supervisor and peer raters. These results demonstrate that raters are employing all scale points, although the "1" and "2" points are used minimally, especially by peers.

Table 4.8

LVI Army-Wide Ratings: Use of Scale Points by Peer and Supervisor Raters (percent)

	7	6	5	4	3	2	1
Peer Raters							
Technical Knowledge/Skill	9.2	25.7	27.5	21.3	10.1	4.4	1.8
Effort	7.1	16.4	27.4	22.4	14.1	8.9	3.6
Following Regulations	8.2	19.0	26.7	21.6	13.1	7.8	3.5
Integrity	10.8	20.4	26.6	19.9	11.2	7.3	3.8
Leadership	5.9	13.8	22.2	22.0	17.9	12.1	6.1
Maintaining Equipment	12.0	22.6	27.0	20.2	11.3	4.7	2.2
Military Appearance	13.3	21.8	26.5	18.6	10.8	5.8	3.3
Physical Fitness	12.2	22.0	28.1	19.0	10.7	5.6	2.6
Self-Development	6.1	15.9	26.4	23.0	15.8	9.2	3.6
Self-Control	12.2	20.0	24.1	18.5	12.5	8.0	4.7
Overall Effectiveness	5.5	18.9	34.7	23.2	11.4	4.5	1.7
NCO Potential	8.8	18.5	23.3	18.6	13.5	10.3	7.0
Supervisor Raters							
Technical Knowledge/Skill	6.2	17.6	29.4	25.5	14.8	5.4	1.1
Effort	7.5	15.3	25.0	19.8	15.4	13.2	3.7
Following Regulations	9.2	18.7	26.2	19.7	13.7	9.3	3.3
Integrity	11.5	20.2	27.0	17.7	11.6	8.8	3.2
Leadership	3.8	9.6	19.1	20.8	21.6	17.8	7.2
Maintaining Equipment	10.0	18.9	25.5	20.7	15.5	7.0	2.4
Military Appearance	12.4	19.0	26.0	18.4	13.1	8.3	2.7
Physical Fitness	13.6	20.1	29.6	17.5	10.5	6.2	2.4
Self-Development	4.5	11.5	23.6	23.2	19.7	13.5	3.9
Self-Control	13.5	22.1	23.7	17.6	11.7	7.7	3.6
Overall Effectiveness	3.9	17.0	32.7	24.0	14.4	6.6	1.4
NCO Potential	6.3	18.6	22.4	18.6	14.8	12.5	6.8

Note. Number of peer raters ranges from 24,764 to 25,882; number of supervisor raters ranges from 17,354 to 17,903.

The mean ratings for this LVI sample are very similar to those obtained for the CVI sample, as shown in Table 4.9. In addition, the peer ratings are slightly higher than the supervisor ratings. The spread or differentiation of the ratings across ratees is indicated by the standard deviations, which are also reported on Table 4.9. On average, the spread of the ratings obtained for the LVI sample is similar to that obtained for the CVI sample. The standard deviation of the supervisory ratings for the LVI sample is quite comparable with that of the peer ratings for this same sample.

Overall, the distributions of supervisor and peer ratings for the LVI sample seem appropriate. They show few signs of errors of central tendency or leniency.

Table 4.9

LVI Army-Wide Ratings: Means and Standard Deviations

	Peer Raters[a]		Supervisor Raters[b]	
Dimension	Mean	SD	Mean	SD
Technical Knowledge/Skill	4.82	1.36	4.54	1.31
Effort	4.39	1.50	4.25	1.58
Following Regulations	4.50	1.51	4.49	1.55
Integrity	4.62	1.55	4.63	1.57
Leadership	4.07	1.58	3.71	1.55
Maintaining Equipment	4.81	1.45	4.57	1.50
Military Appearance	4.78	1.54	4.63	1.56
Physical Fitness	4.79	1.48	4.81	1.50
Self-Development	4.31	1.48	4.02	1.48
Self-Control	4.58	1.63	4.71	1.61
Overall Effectiveness	4.64	1.28	4.47	1.29
NCO Potential	4.32	1.68	4.18	1.66
Mean Across All Rating Dimensions	4.55	1.50	4.42	1.51

[a] N = 24,764 - 26,095.
[b] N = 17,354 - 17,993.

__Interrater reliability__. Interrater reliability results for the Army-wide scales are presented in Table 4.10. These are shown for peer, supervisor, and pooled peer and supervisor ratings. The intraclass correlations that reflect the reliability of a single rater are labeled $r_{(11)}$, and the intraclass correlations that reflect the reliability of the *mean* ratings across raters are labeled $r_{(kk)}$. Because the latter intraclass correlations depend in part on the average number of raters per ratee, the one-rater indices are best for comparing the relative levels of interrater agreement for different rater groups.

Table 4.10

LVI Army-Wide Ratings: One-Rater and k-Rater[a] Reliabilities of Dimension Ratings

Dimension	Peer Ratings[b] $r_{(11)}$	Peer Ratings[b] $r_{(kk)}$	Supervisor Ratings[c] $r_{(11)}$	Supervisor Ratings[c] $r_{(kk)}$	Pooled Peer/Sup. Ratings[d] Coefficient Alpha
Technical Knowledge/Skill	.25	.49	.39	.53	.56
Effort	.24	.47	.37	.51	.52
Following Regulations	.25	.49	.38	.52	.56
Integrity	.19	.40	.34	.49	.48
Leadership	.25	.49	.38	.52	.54
Maintaining Equipment	.17	.36	.31	.45	.44
Military Appearance	.29	.54	.44	.59	.62
Physical Fitness	.33	.59	.48	.63	.65
Self-Development	.21	.44	.33	.47	.49
Self Control	.23	.46	.34	.48	.53
Overall Effectiveness	.25	.48	.41	.56	.56
NCO Potential	.29	.53	.44	.58	.60
Median Across All Rating Dimensions	.25	.48	.38	.52	.55
Median Across All Rating Dimensions for CVI Sample	.22	.49	.37	.52	--

Note. $r_{(11)}$ = intraclass correlations reflecting reliability of a single rater.
$r_{(kk)}$ = intraclass correlations reflecting reliability of the mean ratings across raters.

[a] k is the mean number of ratings per ratee.
[b] The average number of peer ratings per ratee ranges from 2.76 to 2.84.
[c] The average number of supervisor ratings per ratee ranges from 1.77 to 1..
[d] Computed by averaging the mean peer rating and the mean supervisor rating; the average number of peer or supervisor ratings per ratee ranges from 3.96 to 4.1.

The one-rater reliabilities on Table 4.10 show that the degree of interrater agreement for peers *and* supervisors is almost exactly the same as was found in the CVI research. Also, supervisors again provided considerably more reliable tings than did peers.

Table 4.10 also indicates that the *mean* ratings are quite reliable. The reliability of the mean peer rating is comparable to that of the mean supervisor rating, but keep in mind that the average numbers of peer ratings per ratee are a bit higher than for supervisors. When peer and supervisor ratings are pooled, the additional numbers of raters per ratee increase the level of reliability for the combined peer/supervisor ratings to a level somewhat higher than that of the mean supervisor ratings.

In sum, the interrater reliabilities in the present sample are nearly identical to those obtained for the CVI sample. All of the mean ratings -- peer, supervisor, and pooled peer/supervisor -- have acceptable levels of reliability.

Factor analysis results. Several factor analyses were conducted on the Army-wide soldier ratings for the LVI sample. Ratings made by peers on the 10 behavior-based rating dimensions were intercorrelated and factor analyzed, and the results were compared with the factor structure for the ratings of the CVI sample. The same procedure was followed for the supervisor ratings and for the pooled peer and supervisor ratings.

Tables 4.11 - 4.13 show the three-factor, rotated solutions for peer, supervisor, and pooled peer/supervisor ratings respectively. These tables demonstrate the remarkable similarity of the rotated factor structures for the CVI and LVI samples. With one small exception, the three factors obtained in the CVI sample were very closely replicated with the LVI data. The one exception is in the factor analysis of the peer ratings for the LVI sample where the factors emerged in a different order, and two of the scales -- Self-Development and Maintaining Equipment -- had their highest loading on a different factor than they did in the CVI factor analysis. Even so, the values of the factor loadings for the LVI peer rating data were generally very similar to those obtained for the CVI data.

It is worth noting that these same three factors were also obtained in factor analyses of performance rating data for a sample of 950 second-tour soldiers, which was collected using a set of rating scales very similar to those used to collect the present data (Campbell & Zook, 1990).

MOS-Specific Scales

Parallel to what was reported for the Army-wide scales, results relative to MOS-specific rating distributions and interrater reliabilities are described below.

Rating distributions. The means and standard deviations of the MOS-specific ratings for each Batch A MOS are presented in Table 4.14. Peer and supervisor rating results are shown separately. In general, the means and standard deviations for this LVI sample are extremely similar to those obtained for the CVI sample.

Table 4.11

Comparison of LVI and CVI Army-Wide Factor Analysis[a] Results: Pooled Peer/Supervisor Ratings[b]

	Factor Loadings (LVI/CVI)		
Dimension	1	2	3
Technical Knowledge/Skill	.67 / .71	.30 / .28	.38 / .30
Leadership	.65 / .69	.34 / .30	.44 / .37
Effort	.66 / .69	.47 / .43	.32 / .26
Self-Development	.52 / .57	.42 / .38	.46 / .38
Maintaining Equipment	.50 / .54	.41 / .34	.41 / .35
Following Regulations	.39 / .41	.73 / .69	.31 / .30
Self-Control	.19 / .22	.65 / .63	.20 / .20
Integrity	.44 / .50	.66 / .59	.30 / .28
Military Appearance	.31 / .32	.35 / .32	.57 / .57
Physical Fitness	.24 / .21	.16 / .15	.49 / .49
Percent Common Variance	37.7 / 44.9	36.6 / 32.7	25.6 / 22.4

Note. Sample size is 7,919 for LVI and 8,642 for CVI.

[a] Principal factor analysis, varimax rotation.
[b] Computed by averaging the mean peer rating and the mean supervisor rating.

Table 4.12

Comparison of LVI and CVI Army-Wide Factor Analysis[a] Results: Peer Ratings

	Factor Loadings (LVI/CVI)		
Dimension	1	2	3
Following Regulations	.68 / .65	.31 / .28	.33 / .34
Integrity	.61 / .55	.32 / .29	.40 / .43
Self-Control	.58 / .57	.22 / .19	.19 / .20
Military Appearance	.35 / .31	.57 / .56	.25 / .28
Physical Fitness	.18 / .15	.52 / .50	.25 / .22
Self-Development	.44 / .40	.48 / .38	.42 / .49
Maintaining Equipment	.40 / .35	.44 / .39	.39 / .43
Effort	.45 / .45	.36 / .29	.58 / .60
Technical Knowledge/Skill	.33 / .30	.40 / .32	.58 / .65
Leadership	.38 / .32	.48 / .40	.54 / .62
Percent Common Variance	37.9 / 35.1	31.7 / 26.4	30.6 / 38.5

Note. Sample size is 9,021 for LVI and 8,633 for CVI.

[a] Principal factor analysis, varimax rotation.

Table 4.13

Comparison of LVI and CVI Army-Wide Factor Analysis[a] Results: Supervisor Ratings

	Factor Loadings (LVI/CVI)		
Dimension	1	2	3
Leadership	.67 / .68	.31 / .30	.36 / .34
Technical Knowledge/Skill	.67 / .69	.27 / .26	.32 / .29
Effort	.66 / .70	.44 / .40	.28 / .25
Self-Development	.53 / .55	.34 / .34	.44 / .39
Maintaining Equipment	.50 / .53	.37 / .32	.40 / .38
Following Regulations	.41 / .42	.68 / .66	.29 / .30
Integrity	.44 / .49	.62 / .57	.28 / .29
Self Control	.19 / .22	.61 / .61	.22 / .23
Military Appearance	.33 / .32	.35 / .32	.54 / .55
Physical Fitness	.24 / .19	.18 / .17	.47 / .47
Percent Common Variance	41.6 / 45.9	34.5 / 31.1	24.0 / 23.0

Note. Sample size is 9,728 for LVI and 8,642 for CVI.

[a] Principal factor analysis, varimax rotation.

Interrater reliability. Interrater reliability results for the MOS-specific ratings are shown in Tables 4.15 and 4.16. Table 4.15 presents one-rater reliabilities. As with the Army-wide ratings, peer ratings are not very reliable at the one-rater level and supervisor ratings are considerably more reliable. Table 4.16 shows that the mean dimension level peer and supervisor ratings are considerably more reliable, but not on average as reliable as the Army-wide mean dimension ratings.

Table 4.14

LVI MOS-Specific Ratings: Means Across All Rating Dimensions, by MOS

	MOS									
	11B	13B	19E	19K	31C	63B	71L	88M	91A	95B
Number of Rating Dimensions	13	11	9	9	7	12	9	11	10	12
Peer Ratings										
Mean	4.70	4.69	4.85	4.76	4.80	4.75	5.04	4.89	4.81	4.70
Standard Deviation	1.03	1.04	.96	.96	1.12	1.15	1.13	1.04	1.04	.97
Average Number of Ratees	823	799	232	631	327	530	307	568	685	424
Supervisor Ratings										
Mean	4.64	4.70	4.65	4.73	4.70	4.30	4.72	4.70	4.65	4.62
Standard Deviation	1.13	1.27	1.10	1.07	1.22	1.28	1.23	1.19	1.20	1.05
Average Number of Ratees	821	744	215	620	414	669	561	601	663	410

Table 4.15

LVI MOS-Specific Ratings: One-Rater Reliabilities of Dimension Ratings, by MOS

	MOS									
	11B	13B	19E	19K	31C	63B	71L	88M	91A	95B
Number of Rating Dimensions	13	11	9	9	7	12	9	11	10	12
Peer Ratings										
Median Dimension Reliability	.19	.14	.11	.14	.24	.17	.08	.17	.20	.19
Range Across Dimensions	.12-.23	.11-.20	.02-.16	.08-.24	.17-.34	.07-.28	.02-.26	.08-.22	.14-.24	.08-.21
Average Ratings per Ratee	2.84	2.79	2.53	3.13	2.20	2.02	1.65	2.81	2.89	3.17
Supervisor Ratings										
Median Dimension Reliability	.25	.18	.25	.19	.32	.37	.32	.32	.28	.26
Range Across Dimensions	.16-.39	.11-.32	.09-.32	.10-.30	.21-.44	.22-.49	.29-.41	.21-.87	.18-.38	.12-.39
Average Ratings per Ratee	1.91	1.70	1.81	1.98	1.68	1.67	1.56	1.74	1.60	1.76

Table 4.16

LVI MOS-Specific Ratings: *k*-Rater* Reliabilities of Dimension Ratings, by MOS

	MOS									
	11B	13B	19E	19K	31C	63B	71L	88M	91A	95B
Number of Rating Dimensions	13	11	9	9	7	12	9	11	10	12
Peer Ratings										
Median Dimension Reliability	.40	.31	.24	.33	.41	.29	.12	.36	.43	.42
Range Across Dimensions	.27-.46	.25-.42	.06-.33	.21-.49	.31-.52	.13-.43	.03-.31	.21-.44	.31-.47	.21-.46
Average Ratings per Ratee	2.84	2.79	2.53	3.13	2.20	2.02	1.65	2.81	2.89	3.17
Median CVI Dimension Reliability	.42	.34	.41	--	.34	.33	.11	.35	.26	.42
Supervisor Ratings										
Median Dimension Reliability	.38	.27	.38	.31	.45	.49	.43	.41	.39	.38
Range Across Dimensions	.27-.55	.17-.46	.15-.46	.18-.45	.31-.57	.32-.61	.40-.54	.30-.55	.26-.51	.18-.53
Average Ratings per Ratee	1.91	1.70	1.81	1.98	1.68	1.67	1.56	1.74	1.60	1.76
Median CVI Dimension Reliability	.42	.40	.40	--	.42	.48	.45	.34	.34	.32

* *k* is the mean number of ratings per ratee.

Conclusions

For both the Army-wide and MOS-specific rating scales, the mean, variability, and reliability of the peer, supervisor, and pooled peer/supervisor ratings appear quite acceptable and are comparable to what was found in the CVI research. Factor analyses of the Army-wide ratings showed that the three-factor CVI solution is replicated in the present data. Accordingly, the three composites shown in Table 4.17 are proposed as the basic scores for the Army-wide rating data. As in CVI research, unit weighting of each dimension is recommended when computing scores for each rating composite. Definitions for the composites are also presented in Table 4.17.

Table 4.17

Composition and Definition of Proposed LVI Army-Wide Rating Composites

Factor Name and Definition	Percent Common Variance Accounted For by Relevant Factor[a] (LVI/CVI)	Dimensions Included
1. Technical Skills and Job Effort: Exerting effort over the full range of job tasks; engaging in training or other development activities to increase proficiency; persevering under dangerous or adverse conditions; and demonstrating leadership and support toward peers.	37.8/44.9	Technical Knowledge/Skill Leadership Effort Self-development Maintaining Equipment
2. Personal Discipline: Adhering to Army rules and regulations; exercising self-control; demonstrating integrity in day-to-day behavior; and not causing disciplinary problems.	36.6/32.7	Following Regulations Self-control Integrity
3. Physical Fitness/Military Bearing: Maintaining an appropriate military appearance and bearing and staying in good physical condition.	25.6/22.4	Military Bearing Physical Fitness

[a] Factor analysis of pooled peer/supervisor ratings.

The interrater reliabilities of these three unit-weighted composites are shown in Table 4.18. As with the dimension-level ratings, the pooled ratings are the most reliable. The pooled peer and supervisor ratings may also be more valid in the sense that they draw on both peer and supervisor perspectives. It has been argued (Borman, 1974; Campbell, Dunnette, Lawler, & Weick, 1970) that typically in organizations peers and supervisors each have relevant and important performance information on ratees but that these two rating sources may have *different* information because of different roles and opportunity to observe performance-related behavior. Thus, we would expect that peer and supervisor ratings, taken together, should provide more valid performance information on ratees than either of the rating sources individually.

Table 4.18

One-Rater and k-Rater[a] Reliabilities of Proposed LVI Army-Wide Rating Composites

	Technical Skill/Effort	Personal Discipline	Fitness/ Bearing
Peer Ratings			
One-Rater	.32	.29	.33
k-Rater	.57	.54	.58
Average Ratings per Ratee	2.86	2.86	2.86
Supervisor Ratings			
One-Rater	.47	.44	.49
k-Rater	.61	.58	.64
Average Ratings per Ratee	1.81	1.81	1.81
Pooled Peer/Supervisor Ratings[b]			
Coefficient Alpha	.61	.60	.65

[a] k is the mean number of ratings per ratee.
[b] Computed by averaging the mean peer rating and the mean supervisor rating.

Evidence that peer and supervisor raters are not parallel measures of the same thing is contained in the values for coefficient alpha when the average peer and average supervisor ratings are used as the two components of a composite. The reliability of the composite is not as high as would be expected if they were parallel measures. In general, the intercorrelations among peers and among supervisors are higher than the intercorrelations between peers and supervisors. At the extreme, coefficient alpha of the composite of average peer plus average supervisor ratings would be zero if the intercorrelations between peers and supervisors were all zero.

Correlations among the three Army-wide unit-weighted composites are presented in Table 4.19. Although some of these correlations are quite high, on the basis of our experience in CVI there should be sufficient differentiation between these LVI composites to provide multidimensional performance information.

Table 4.19

Intercorrelations Among Proposed LVI Rating Composites

	Technical Skill/Effort	Personal Discipline
Based on Peer Ratings Only[a]		
Personal Discipline	.87	
Fitness/Bearing	.66	.59
Based on Supervisor Ratings Only[b]		
Personal Discipline	.86	
Fitness/Bearing	.63	.59
Based on Pooled Peer/Supervisor Ratings[c]		
Personal Discipline	.89	
Fitness/Bearing	.65	.60

[a] N = 9,114 - 9,121.
[b] N = 9,932 - 9,937.
[c] Computed by averaging the mean peer rating and the mean supervisor rating; N = 8,158 - 8,164.

For the MOS-specific ratings, the interrater reliabilities of the unit-weighted composites of all dimensions are shown, by MOS, in Table 4.20. The mean supervisor ratings are generally more reliable than the pooled peer and supervisor ratings for these MOS-specific rating scales. However, as with the Army-wide ratings, the pooled ratings could be seen as containing more information about job performance than the supervisor ratings alone. This would be especially applicable for MOS 31C where coefficient alpha is lower than the reliability for either peers or supervisors. The composite is multidimensional.

Table 4.20

One-Rater and k-Rater[a] Reliabilities of Proposed LVI MOS-Specific Rating Composites

	MOS									
	11B	13B	19E	19K	31C	63B	71L	88M	91A	95B
Peer Ratings										
One-Rater	.27	.18	.15	.20	.35	.25	.15	.22	.27	.26
k-Rater	.52	.40	.32	.44	.54	.41	.24	.46	.52	.54
Average Ratings Per Ratee	2.89	2.93	2.57	3.21	2.23	2.03	1.71	3.00	3.03	3.34
Supervisor Ratings										
One-Rater	.40	.31	.38	.28	.39	.46	.44	.42	.40	.37
k-Rater	.56	.45	.54	.44	.53	.59	.57	.57	.53	.52
Average Ratings Per Ratee	1.92	1.82	1.89	2.05	1.73	1.68	1.66	1.84	1.71	1.82
Pooled Peer/ Supervisor Ratings[b]										
Coefficient Alpha	.51	.53	.42	.51	.29	.57	.37	.50	.51	.61

[a] k is the mean number of ratings per ratee.
[b] Computed by averaging the mean peer rating and the mean supervisor rating.

In sum, the Army-wide ratings provide a reliable and interpretable multidimensional depiction of three different performance areas. The MOS-specific ratings provide a single, reliable job performance composite that also represents a significant component of total performance.

DEVELOPMENT OF BASIC SCORES FOR HANDS-ON AND JOB KNOWLEDGE PERFORMANCE MEASURES

This section outlines the procedures used to formulate the basic criterion scores for the first-tour Hands-On and Job Knowledge measures. The analyses represent a replication of the CVI efforts described in the Project A Annual Report for 1986 (Campbell, 1988). There were two specific objectives: (a) to edit the data in accordance with previously established procedures so as to maximize available sample sizes without compromising data quality and (b) to aggregate the individual item, task, or scale scores into a set of more manageable basic scores that preserve the original information and that can be used in constructing a model of job performance (see Chapter 6).

Definition of Terms

Certain terms used throughout this section have meaning that is specific to this subject matter. As an aid to understanding, the more critical terms are defined below.

Task: A discrete set of behaviors performed to accomplish a single job requirement; includes a situation with initiating cues and conditions, the steps or activities that are to be performed, and the task standards that signal successful completion.

Common Task: A task drawn from the Soldier's Manual of Common Tasks, Skill Level 1 (STP 21-1-SMCT, October 1985) or from the Soldier's Manual of Common Tasks, Skill Level 2/3/4 (STP 21-24-SMCT, Draft, January 1987). These are basic soldiering tasks (first aid, personal weapons, map reading, etc.) that are required of all soldiers, regardless of MOS. Soldiers are responsible for performance of all common tasks at their own skill level; in some cases, the task selection panel also chose higher skill level tasks for testing.

MOS-specific Task: A task drawn from the Soldier's Manual for a given MOS. These tasks are central to the job of the soldiers in the MOS and are typically unique to the MOS. As with common tasks, soldiers are responsible for tasks at their own skill levels, and the task selection panel may also have chosen higher skill level tasks to represent the job.

Basic Tasks: Tasks that represent common soldiering skills but are not necessarily mandated for every MOS. Most of the Basic Tasks are Common Tasks (i.e., drawn from the Soldier's Manuals of Common Tasks). Many are required only by one or very few MOS, yet do not represent MOS-specific specialized knowledges or skills.

Technical Tasks: Tasks that represent specialized knowledges or skills that are peculiar to specific MOS in both the requirement to perform and the underlying abilities contributing to proficiency.

Task test: A set of performance steps or written items that are focused on a single task. Hands-on test performance steps are scored GO or NO-GO by a trained scorer. Job knowledge test written items are multiple choice, with one correct answer per item, and are scored as Pass or Fail.

Hands-on component: The full set of hands-on performance (job sample) task tests for an MOS; comprises 14-17 task tests.

Job knowledge component: The full set of job knowledge (written) task tests for an MOS; comprises 28-30 task tests.

Track: A separate version of a hands-on or knowledge test prepared to accommodate different types of equipment that may be used in performing the same task.

First tour: A term used within Project A and the Career Force project to designate soldiers who have been in service for 1 to 3 years.

MOS Task-Specific Performance Content

The procedures that were used to select tasks and to develop task tests for each of the nine MOS are described in the Project A Annual Report for 1985 (Campbell, 1987). Before the instruments that had been developed for the Concurrent Validation criterion measurement in 1985 could be used again, technical currency reviews were necessary. Each hands-on and job knowledge component was subjected to rigorous review against existing Army doctrinal training materials by project staff, and revisions were made to items and supporting graphics and handouts as necessary. All revisions were evaluated by the MOS proponent agencies to ensure the technical currency of the tasks and task steps. Their evaluation led to the decision to drop some steps or items and task tests because they addressed performance requirements that were no longer doctrinally correct. A list of the tasks comprising the hands-on and job knowledge test components for each MOS is presented in Appendix A.

As this phase of the project began, a tenth MOS, 19K, the M1 Abrams Armor Crewman, was added to the Batch A cluster of MOS to cover the Army's transition from the M60-series tank (with MOS 19E) to the M1-series tank. The steps in selecting tasks and developing tests for this MOS were the same as those that had been followed for the other MOS.

Data Edits to Control Variance

As with the CVI analyses, there were five known sources of extraneous variance that we wished to control: track differences, missing data, site differences, differences in the number of test steps/items across tasks, and items with marginal psychometric characteristics. The procedures that were developed to minimize the effects of these sources of variance in the CVI analyses were, for the most part, also followed here.

For hands-on tests, tracked versions were prepared as necessary to accommodate the requirement to test using different types of equipment on the same task. These tracks are intended to be parallel versions of the same test. In some cases, equipment variations required only minor changes in a few hands-on steps, or the omission of a few steps. In other cases, although equipment and procedures were dissimilar across the tracks, the behavioral requirements were judged to be the same and provided comparable representation of job content. As with the CVI analyses, we examined the LVI results for evidence of level and dispersion differences across tracks. No anomalous differences were found. Consequently the percentage of steps passed in a task was used as the task score. This transformation corrects for the variation in number of steps performed, while at the same time preserving information about individual differences.

Similarly, scores on tracked task tests in the job knowledge measures were scored on percentage correct to account for different numbers of items, but were not otherwise adjusted.

The second adjustment was for missing data. For some tasks, the difficulties associated with obtaining equipment for certain specialized tests at different sites precluded hands-on testing, either entirely or for segments of the task. Data could also be missing for one of two other reasons: Either the scorer failed to observe a step, or the scorer failed to record the observation as either GO or NO-GO. In either event, the fact that the observation was missing was irrelevant to the soldier's performance. In the job knowledge tests, there were also two likely reasons for missing data: Either the soldier skipped an item (did not record a response on the answer sheet), or the soldier did not get to one or more items at the end of the test booklet. The methods used to adjust for missing data are discussed in greater detail in the next chapter.

The third source of extraneous variance is an issue only with the hands-on tests. There was concern that the hands-on test scores might reflect site differences in the way the measures were administered. Type of testing facility, condition of equipment, local training emphasis and operating procedures, and weather and terrain conditions could interfere with standardization of conditions. Therefore, as with the CVI results, hands-on test scores were standardized by site at the task level to control for the differences.

A fourth source of irrelevant variance consisted of the differences in the number of items or steps used to cover specific task tests. The number of items was not necessarily related to the complexity of the task, and we did not want some tasks to be given more weight than others. For hands-on tests, where the number of steps per task varied widely, task scores were computed as percent-GO, and these task-level scores were used in subsequent analyses. For job knowledge tests, where the number of items per task (or per task cluster, in subsequent analyses) did not vary as much, a percent-correct score was computed at each level (task, cluster, etc.). Table 4.21 shows the overall number of steps in the hands-on component for each MOS and the range of steps per task test. Table 4.22 shows the overall number of items in the job knowledge component for each MOS and the range of items per task test, as well as the nature of revisions for marginal items (described in the next paragraph).

Table 4.21

Number of LVI Hands-On Tests and Steps

	MOS	Task Tests	Steps	Range	Average Steps Per Task
11B	Infantryman[a]	13-14	206-238	4-43	17.2-18.3
13B	Cannon Crewman[b]	16	301-308	5-36	18.8-19.2
19E	M60 Armor Crewman	15	202	6-31	12.5
19K	M1 Armor Crewman[c]	14	214-231	6-36	15.3-16.5
31C	Single Channel Radio Operator[d]	15	353-361	8-72	23.5-24.0
63B	Light-Wheel Vehicle Mechanic	14	152	4-20	10.9
71L	Administrative Specialist[e]	14	165	2-43	12.7
88M	Motor Transport Operator	15	280	3-43	18.7
91A	Medical Specialist	14	222	7-39	15.9
95B	Military Police[f]	13	206-233	4-39	17.2-19.4

[a] For 11B, the number of tasks does not include Engage Targets with M16-Series Rifle, tested on the MACS. Most soldiers were not tested on the task, Set Headspace and Timing on .50 Caliber Machinegun. The task, Conduct Surveillance Without the Use of Electronic Devices, is counted, but it has a single continuously scored product score rather than steps; the task is not included in the Average Steps Per Task figure.

[b] For 13B, six tasks were tested in three tracks, with a slightly different number of steps per track.

[c] For 19K, one task was tested in two tracks, with a slightly different number of steps per track.

[d] For 31C, one task was tested in two tracks, with a slightly different number of steps per track.

[e] For 71L, the task, Type Straight Copy, is counted, but it has a single continuously scored product score rather than steps. The task is not included in the Average Steps Per Task figure.

For 95B, the number of tasks does not include Engage Targets with M16-Series Rifle, tested on the MACS. One task was tested in three tracks, with a slightly different number of steps per track.

Finally, the job knowledge test data were adjusted for marginal items -- those items that appeared to be no longer content valid. Because of changes in equipment and changes in the proscribed steps in performance between the CVI testing and the LVI testing, not all test items were correct when the tests were administered -- this despite rigorous currency review and careful proponent agency examination. In some cases, another of the alternative answers was now correct, and simple rekeying corrected the problem; in other cases, more than one response was now correct, and the item was double-keyed. In still other cases, no correct answer was now included in the list of responses, and those items were zero-weighted (i.e., dropped). Table 4.22 shows the extent of the revisions or deletions.

Table 4.22

Number of LVI Job Knowledge Tests and Items, and Revisions to Eliminate Marginal Items

	MOS	Number of Tasks	Items Revised/ Dropped	Total Number of Items	Range	Average Items per Task
11B	Infantryman[a]	28-29	6/1	175-186	2-12	6.2-6.4
13B	Cannon Crewman[b]	30	7/2	177-180	2-16	5.9-6.0
19E	M60 Armor Crewman	30	6/2	191	4-12	6.4
19K	M1 Armor Crewman[c]	30	9/7	172-173	3-12	5.7-5.8
31C	Single Channel Radio Operator	30	6/2	204	3-12	6.8
63B	Light-Wheel Vehicle Mechanic	29	3/0	188	3-11	6.5
71L	Administrative Specialist	23	9/1	121	3-9	5.3
88M	Motor Transport Operator	28	1/0	163	2-11	5.8
91A	Medical Specialist	29	6/3	214	3-12	7.4
95B	Military Police[d]	30	18/5	198-200	2-13	6.6-6.7

[a] For 11B, most soldiers were not tested on the task, Set Headspace and Timing on the .50 Caliber Machinegun.

[b] For 13B, 14 tasks were tested in three tracks, with a slightly different number of items per track.

[c] For 19K, one task was tested in two tracks, with a slightly different number of items per track.

[d] For 95B, one task was tested in two tracks, with a slightly different number of items per track.

Construction of Basic Criterion Scores

As the first step in replicating the CVI procedures for constructing the basic scores, tasks were clustered into Functional Categories (as described in the Project A Annual Report for 1986 (Campbell, 1988)). The Functional Category rules developed for the CVI define 10 across-MOS categories, plus one to five MOS-specific Technical Categories per MOS (except 11B, where all tasks fit into the 10 across-MOS categories).

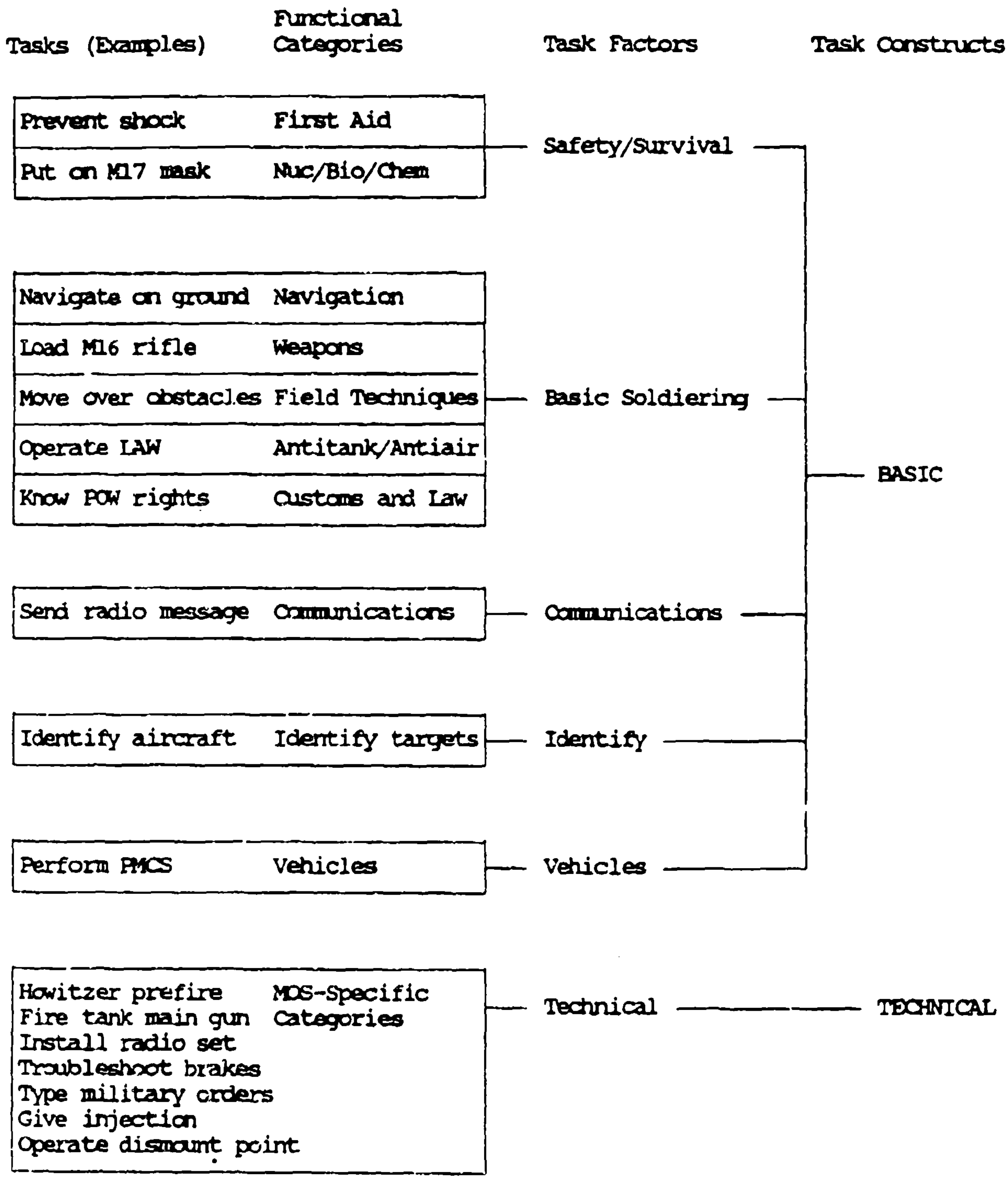
The Functional Category scores for job knowledge tests were computed as the percentage of items correct for all tasks assigned to the category. For hands-on tests, the Functional Category score was the mean of the percentage of steps performed correctly for each hands-on task test in the category.

Following the procedures developed with the CVI data, tasks were also sorted into six higher-level groups referred to as Task Factors (Communication, Vehicles, Basic Techniques, Identify Targets, Technical, and Safety/Survival (CVBITS)). Tasks were also combined into just two groups: Basic (i.e., Army-wide) and Technical (i.e., MOS-specific).

In general, the grouping schemes are hierarchical: Tasks (the lowest level) are placed in Functional Categories, the Functional Categories (level two) are aggregated to form the six Task Factors (level three), and Task Factors are then aggregated to form the two Task Constructs (level four), as diagrammed in Figure 4.1.

There were three exceptions to the hierarchical scheme. One exception is the 11B Infantryman MOS, in which all tasks are assigned to the across-MOS Functional Categories (level two) and to the across-MOS Task Factors (level three). At the Task Construct level (level 4), however, the 11B tasks are all placed under the Technical heading, rather than under the Basic heading. The second exception concerns the tasks involving vehicle maintenance and operation; for the 63B Light-Wheel Vehicle Mechanic, tasks in the MOS-specific Functional Category labeled Vehicle Operations and Recovery are not subsequently placed into the Technical Task Factor, but rather into the Vehicles Task Factor and thence into the Basic Task Construct. The third exception is in the case of the 88M Motor Transport Operator, where all tasks fell into the across-MOS Functional Categories; as a result the 88M has no Technical Task Construct. These designations are the convention that was used for the current analyses. For reasons that will be described in Chapter 7 a slightly different convention was used for the LVI performance modeling analyses.

Not every MOS had representation in every Functional Category, nor in every Task Factor. The task lists in Appendix A identify the Functional Category and Task Factor for every task. With two exceptions (the 11B and 88M, as described above), every MOS has tasks in both the Basic and Technical Task Constructs. For job knowledge tests, the scores for each level are formed by computing the proportion of items passed across all tasks in the grouping. For hands-on tests, the score for each grouping is the mean of the task (proportion passed) scores.



NOTE: Exceptions to the hierarchical structure are shown in Appendix A.

Figure 4.1. Hierarchical relationships among Functional Categories, Task Factors, and Task Constructs.

Confirmatory Analyses of Alternative Definitions of Basic Hands-On and Job Knowledge Scores

As noted above, the Functional Categories were constructed via expert judgment. The number of variables was reduced further by a series of exploratory and confirmatory analyses. The result of the first round of exploratory analyses in CVI was the set of six Task Factors (Campbell, 1988). When scores constructed on these variables were subjected to another round of empirical factor analysis with other criterion variables (from various rating scales and administrative records), the hands-on and job knowledge test components each split between two higher order factors, with the Basic (non-MOS-specific) Task Factor scores, for both hands-on and job knowledge tests, loading on the factor labeled General Soldiering Proficiency, and the Technical (MOS-specific) Task Factor scores, for both hands-on and job knowledge tests, loading on the factor labeled Core Technical Proficiency.

For the LVI data, confirmatory factor analyses were conducted to assess the fit of alternative levels of score aggregation. These analyses served two purposes: They were used to assess the relative merits of each model and to corroborate the CVI decision to use the six task factor scores (CVBITS). The analysis required the computation of separate tests of goodness of fit for hands-on and job knowledge test data, for each of the 10 MOS, on each of three competing models. The three models to be tested were: a one-factor model, postulating the existence of a single factor in the data; a two-factor model, proposing the Basic and the Technical Task Constructs; and three-to-six-factor model (the number of factors varying among MOS and component), using the Task Factors. These were done using the LISREL confirmatory factor analysis program (Joreskog & Sorbom, 1981). The approach parallels the confirmatory analyses conducted in the CVI model-building process.

In conducting a confirmatory factor analysis with LISREL, it is necessary to specify the structure of three different parameter matrixes: Lambda-Y, the hypothesized factor structure matrix (a matrix of regression coefficients for predicting the observed variables from the underlying latent constructs); Theta-Epsilon, the matix of uniqueness or error commponents (and intercorrelations); and Psi, the matrix of covariances among the factors. For each analysis, the diagonal elements of Psi, the factor covariance matrix, were set to 1.0, forcing a "standardized" solution. Off-diagonal elements in Psi thus represented the correlations among the factors.

As a product of the analysis, LISREL computes a goodness-of-fit index based on a comparison of the actual correlations among the observed variables and the correlations estimated from Lambda-Y, Theta-Epsilon, and Psi. The goodness of fit is distributed as chi-square, with degrees of freedom dependent on the number of observed variables and the number of parameters estimated. The expected value of chi-square is equal to the degrees of freedom; a significant chi-square is a sign that the model does not fit the correlations among the observed variables.

Table 4.23 shows the value of chi-square for each MOS and for each of the three alternative criterion score model structures (the single criteron factor, the two Task Constructs, and the three to six Task Factors), for the Job Knowledge Test data. Table 4.24 shows the same information for the Hands-On Test data.

Table 4.23

Goodness-of-Fit Tests for Three Models for LVI Job Knowledge Tests for 10 MOS

MOS		Model[a]	Chi-Square	df	p	Adjusted Goodness of Fit	Root Mean Square Residual	N
11B	Infantryman[b]	One Factor	120.07	20	.000	.939	.048	890
		SBCI	107.04	18	.000	.940	.044	
13B	Cannon Crewman	One Factor	106.52	35	.000	.959	.035	809
		Two Factor	66.45	34	.001	.973	.028	
		SBCIT	50.51	29	.008	.976	.023	
19E	M60 Armor Crewman	One Factor	52.43	35	.029	.933	.051	248
		Two Factor	52.43	35	.029	.933	.051	
		SBCIT	33.52	29	.257	.949	.039	
19K	M1 Armor Crewman	One Factor	71.37	35	.000	.972	.030	824
		Two Factor	66.05	34	.001	.974	.029	
		SBCIT	58.22	29	.001	.973	.027	
31C	Single Channel Radio Operator	One Factor	159.45	77	.000	.938	.045	528
		Two Factor	138.03	76	.000	.945	.039	
		SBCIVT	110.94	68	.001	.951	.035	
63B	Light-Wheel Vehicle Mechanic	One Factor	102.16	44	.000	.961	.038	716
		Two Factor	97.31	43	.000	.962	.036	
		SBVT	78.85	40	.000	.967	.031	
71L	Administrative Specialist	One Factor	78.64	35	.000	.963	.043	671
		Two Factor	48.91	34	.047	.976	.033	
		SBT	46.76	32	.045	.976	.033	
88M	Motor Transport Operator[c]	One Factor	32.65	20	.037	.978	.028	674
		SBIV	28.78	18	.051	.979	.026	
91A	Medical Specialist	One Factor	69.99	27	.000	.967	.035	793
		Two Factor	66.22	26	.000	.968	.034	
		SBIVT	44.04	21	.002	.974	.022	
95B	Military Police	One Factor	97.59	44	.000	.940	.048	446
		Two Factor	90.39	43	.000	.943	.045	
		SBCIVT	65.26	35	.001	.950	.039	

[a] The one-factor model tests the fit of a single factor for all of the variance in Job Knowledge Test scores. The two-factor model proposes a Basic (across MOS) factor and a Technical (MOS-specific) factor. The third model factors are S = Safety/Survival, B = Basic Soldiering, C = Communications, I = Identify Targets, V = Vehicles, and T = Technical.
[b] MOS 11B has no Basic Task Construct.
[c] MOS 88M has no Technical Task Construct.

Table 4.24

Goodness-of-Fit Tests for Three Models for LVI Hands-On Tests for 10 MOS

MOS		Model[a]	Chi-Square	df	p	Adjusted Goodness of Fit	Root Mean Square Residual	N
11B	Infantryman[b]	One Factor	13.27	9	.151	.988	.024	890
		SBC	9.41	8	.309	.991	.020	
13B	Cannon Crewman	One Factor	65.81	20	.000	.962	.050	773
		Two Factor	55.02	19	.000	.966	.045	
		SBCT	38.55	16	.001	.972	.036	
19E	M60 Armor Crewman	One Factor	15.51	14	.344	.963	.049	243
		Two Factor	15.51	13	.277	.961	.049	
		SBCT	8.71	10	.560	.971	.038	
19K	M1 Armor Crewman	One Factor	61.89	20	.000	.963	.051	749
		Two Factor	61.89	19	.000	.961	.051	
		SBCT	53.59	16	.000	.960	.045	
31C	Single Channel Radio Operator	One Factor	110.05	35	.000	.922	.083	446
		Two Factor	94.36	34	.000	.931	.071	
		SBCVT	50.44	29	.008	.957	.041	
63B	Light-Wheel Vehicle Mechanic	One Factor	35.19	27	.134	.979	.034	624
		Two Factor	34.87	26	.114	.978	.034	
		SBVT	25.55	23	.323	.982	.028	
71L	Administrative Specialist	One Factor	47.04	14	.000	.958	.047	641
		Two Factor	25.76	13	.018	.975	.033	
		SBT	24.79	11	.010	.972	.033	
88M	Motor Transport Operator[c]	One Factor	20.17	5	.001	.959	.040	588
		SBV	12.93	4	.012	.967	.030	
91A	Medical Specialist[d]	SBT						794
95B	Military Police	One Factor	7.10	9	.627	.988	.023	444
		Two Factor	7.01	8	.536	.986	.023	
		SBVT	2.16	6	.905	.994	[illegible]	

[a] The one-factor model tests the fit of a single factor for all of the variance in Hands-On Test scores. The two-factor model proposes a Basic (across MOS) factor and a Technical (MOS-specific) factor. The third model factors are S = Safety/Survival, B = Basic Soldiering, C = Communications, I = Identify Targets, V = Vehicles, and T = Technical.
[b] MOS 11B has no Basic Task Construct.
[c] MOS 88M has no Technical Task Factor.
[d] MOS 91A hands-on data were overfit by all three models.

As another way of looking at these results, Tables 4.25 and 4.26 show the improvement in fit provided by each model for the job knowledge and hands-on data, respectively.

Examination of the above results from LVI argues for the retention of the six Task Factor scores for both the Hands-on and Job Knowledge measures. That is, the basic scores for HO and JK that serve as input for the LVI performance modeling analysis will be the same as they were for the CVI performance model analysis. Overall, based on Tables 4.23 - 4.26, not much information is lost when the Functional Categories are aggregated into the six Task Factor scores, but the degree of information loss increases when the number of scores is reduced from six to two. Consequently, the six-score solution was retained. It preserves the most information with fewest scores and it is consistent with how the HO and JK performance measures were scored in CVI.

FINAL ARRAY OF LVI BASIC PERFORMANCE SCORES

This chapter has described the development of the basic scores for each of the first-tour performance criterion measures that were used to assess the LVI sample. These are the scores that were put through the final editing and score imputation procedures for the LVI data file. They are also the scores that form the basis for the confirmatory tests of the LVI model of first-tour job performance. A summary list of the basic performance scores produced by the analyses described in this chapter is given in Table 4.27.

The latent structure model that best fits the data (i.e., the pattern of covariation among the basic scores) will dictate how composites of these scores should be computed. The composites, which serve as the best estimates of the latent variables, are the criterion scores against which the Experimental Predictor Battery will be validated. The model building and validation results are described in Chapters 6 and 7 respectively.

Table 4.25

Comparison of Goodness-of-Fit for Three Models for LVI Job Knowledge Tests for 10 MOS

MOS		Models Compared[a]	Chi-Square	df	p
11B	Infantryman[b]	One Factor vs. SBCI	13.03	2	.001
13B	Cannon Crewman	One Factor vs. Two Factor	40.07	1	.000
		One Factor vs. SBCIT	56.01	6	.000
		Two Factor vs. SBCIT	15.94	5	.007
19E	M60 Armor Crewman	One Factor vs. Two Factor	4.79	1	.029
		One Factor vs. SBCIT	18.91	6	.004
		Two Factor vs. SBCIT	14.12	5	.015
19K	M1 Armor Crewman	One Factor vs. Two Factor	5.32	1	.021
		One Factor vs. SBCIT	13.15	6	.041
		Two Factor vs. SBCIT	7.83	5	.166
31C	Single Channel Radio Operator	One Factor vs. Two Factor	21.42	1	.000
		One Factor vs. SBCVIT	48.51	9	.000
		Two Factor vs. SBCIVT	27.09	8	.001
63B	Light-Wheel Vehicle Mechanic	One Factor vs. Two Factor	4.85	1	.028
		One Factor vs. SBVT	23.31	4	.000
		Two Factor vs. SBVT	18.46	3	.000
71L	Administrative Specialist	One Factor vs. Two Factor	29.73	1	.000
		One Factor vs. SBT	31.88	3	.000
		Two Factor vs. SBT	2.15	2	.341
88M	Motor Transport[c]	One Factor vs. SBIV	3.87	2	.144
91A	Medical Specialist	One Factor vs. Two Factor	3.77	1	.052
		One Factor vs. SBIVT	25.95	6	.000
		Two Factor vs. SBIVT	22.18	5	.000
95B	Military Police	One Factor vs. Two Factor	7.20	1	.007
		One Factor vs. SBCIVT	32.33	9	.000
		Two Factor vs. SBCIVT	25.13	8	.001

[a] The one-factor model tests the fit of a single factor for all of the variance in Job Knowledge Test scores. The two-factor model proposes a Basic (across MOS) factor and a Technical (MOS-specific) factor. The third model factors are S = Safety/Survival, B = Basic Soldiering, C = Communications, I = Identify Targets, V = Vehicles, and T = Technical.
[b] MOS 11B has no Basic Task Construct.
[c] MOS 88M has no Technical Task Construct.

Table 4.26

Comparison of Goodness-of-Fit for Three Models for LVI Hands-On Tests for 10 MOS

MOS		Models Compared[a]	Chi-Square	df	p
11B	Infantryman[b]	One Factor vs. SBC	3.86	1	.049
13B	Cannon Crewman	One Factor vs. Two Factor	10.79	1	.001
		One Factor vs. SBCT	27.26	4	.000
		Two Factor vs. SBCT	16.47	3	.000
19E	M60 Armor Crewman	One Factor vs. Two Factor	0.00	1	.999
		One Factor vs. SBCT	6.80	4	.147
		Two Factor vs. SBCT	6.80	3	.079
19K	M1 Armor Crewman	One Factor vs. Two Factor	0.00	1	.999
		One Factor vs. SBCT	8.30	4	.081
		Two Factor vs. SBCT	8.30	3	.040
31C	Single Channel Radio Operator	One Factor vs. Two Factor	15.69	1	.000
		One Factor vs. SBCVT	59.61	6	.000
		Two Factor vs. SBCVT	43.92	5	.000
63B	Light-Wheel Vehicle Mechanic	One Factor vs. Two Factor	0.32	1	.572
		One Factor vs. SBVT	9.64	4	.047
		Two Factor vs. SBVT	9.32	3	.025
71L	Administrative Specialist	One Factor vs. Two Factor	21.28	1	.000
		One Factor vs. SBT	22.25	3	.000
		Two Factor vs. SBT	0.97	2	.616
88M	Motor Transport[c]	One Factor vs. SBV	7.24	1	.007
91A	Medical Specialist[d]				
95B	Military Police	One Factor vs. Two Factor	0.09	1	.764
		One Factor vs. SBVT	4.94	3	.176
		Two Factor vs. SBVT	4.85	2	.088

[a] Th[illegible]ctor model tests the fit of a single factor for all of the variance in Hands-On Test scores. The [illegible]or model proposes a Basic (across MOS) factor and a Technical (MOS-specific) factor. The third model factors are S = Safety/Survival, B = Basic Soldiering, C = Communications, I = Identify Targets, V = Vehicles, and T = Technical.

[b] MOS 11B has no Basic Task Construct.

[c] MOS 88M has no Technical Task Construct.

[d] LISREL overfit all three models for 91A hands-on component data.

Table 4.27

Basic Criterion Scores Obtained by Analyzing the Psychometric Characteristics of the LVI Performance Measures

ARCHIVAL DATA OBTAINED FROM THE PERSONNEL FILE FORM

Number of awards and certificates
Physical Readiness Test score
Number of Articles 15 and Flag Actions
Individual promotion rate (i.e., deviation from overall mean)
M16/M19 Qualification score

SCORES OBTAINED FROM RATINGS MEASURES

Effort and Leadership (ELS) Factor from Army-Wide BARS
Maintaining Personal Discipline (MPD) Factor from Army-Wide BARS
Physical Fitness and Military Bearing (PFB) Factor from Army-Wide BARS
Average of MOS-Specific BARS scales
Overall Effectiveness Rating
NCO Potential Rating
Combat Performance Prediction Rating (males only)

SCORES OBTAINED FROM HANDS-ON MEASURES

Core Technical (MOS-specific) score
Communications score
Vehicle operation and maintenance score
Basic skills (general soldiering) score
Safety and survival score

SCORES OBTAINED FROM JOB KNOWLEDGE MEASURES

Core Technical (MOS-specific) score
Communications score
Vehicle operation and maintenance score
Basic skills (general soldiering) score
Identifying target and threat vehicles and aircraft
Safety and survival score

Chapter 5
FINAL DATA EDITING AND SCORE IMPUTATION

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This chapter describes the final data editing and score imputation procedures for the Longitudinal Validation first-tour (LVI) job performance measures and the Experimental Battery (EB) of new predictor measures administered to the LVI sample at the time of entry. The performance data will be discussed first, followed by a review and summary of what was done with the Experimental Battery predictory data, which was discussed at some length in a previous report (Campbell & Zook, 1990). The third and final section of this chapter presents a more detailed description of the specific imputation algorithm that was used, as well as a before-and-after evaluation of the effects of imputation.

LVI PERFORMANCE MEASURES

The Longitudinal Validation First-Tour (LVI) data were collected from 11,266 soldiers in 21 Military Occupational Specialties. For the 10 MOS designated as Batch A MOS, the performance measures included:

- Hands-On Tests
- Job Knowledge Tests
- Army-Wide Ratings
- MOS-Specific Ratings
- Combat Performance Prediction Ratings (males only)
- Job History
- Personnel File Form
- Army Job Satisfaction Questionnaire
- Physical Requirements

For the 11 MOS designated as Batch Z, the performance measures included:

- School Knowledge Tests
- Army-Wide Ratings
- Combat Performance Prediction Ratings (males only)
- Personnel File Form
- Army Job Satisfaction Questionnaire
- Physical Requirements

The construction of each of these measures has been described in detail in previous reports (Campbell, 1987; Campbell & Zook, 1990). Briefly, the performance measures can be described as follows:

<u>Hands-On Tests</u>. Observation and scoring of performance on 13-16 carefully sampled job tasks per MOS. Each MOS was tested on a combination of MOS-specific and general soldiering job tasks.

<u>Job Knowledge Tests</u>. Written tests of facts and procedures on 24-30 carefully sampled job tasks per MOS. Each MOS was tested on a combination of MOS-specific and general soldiering facts and procedures.

School Knowledge Tests. Written tests of 115-180 facts and procedures for job tasks taught during training for the MOS.

Army-Wide Ratings. Ratings of performance by peers and/or supervisors on Army-wide dimensions, and the ratee's potential effectiveness as an NCO.

MOS-Specific Ratings. Ratings of performance by peers and/or supervisors on 7-13 MOS-specific dimensions.

Combat Ratings. Ratings of predicted performance in combat situations by peers and/or supervisors on 19 dimensions. These were collected for males only.

Job History. Self-report of the frequency and recency of performance for 26-30 MOS-specific job tasks.

Personnel File Form. Self-report of administrative and personnel information including letters and commendations, Physical Readiness Test score, Marksmanship score, and disciplinary actions.

Job Satisfaction. Self-report of satisfaction with dimensions relevant to the Army, and information about soldier's background.

Physical Requirements. Self-report and supervisor report of the examinee's ability to perform tasks required of the MOS.

The performance measure data are also known as the criterion data. Both of these terms are used to differentiate these data, which measure actual performance, from the predictor data, which are used to predict performance.

Extent of Missing Data

There were 6,815 Batch A examinees and 4,451 Batch Z examinees. Extensive efforts were made to collect complete information from each examinee for all instruments. However, as with all data collection exercises, circumstances precluded complete success. For any individual instrument, information could be partially or completely missing. Some of the chief reasons for incomplete information are listed in Figure 5.1.

The final counts of soldiers for whom data were analyzed for each instrument are given in Tables 5.1 and 5.2 for Batch A and Batch Z MOS, respectively. The column headed Total gives the total number of soldiers tested in each MOS, on any or all instruments. These soldiers were recorded in the "link" file, which contains demographic information and information collected by the Army, such as ASVAB and AFQT scores, for all soldiers in the sample. These data could be linked to the specific performance measure data sets, which were stored individually. The columns for each specific instrument contain the final counts of examinees left in each data set after the missing data had been reconstructed and examinees removed because their level of missing data for that instrument was higher than acceptable. The final column of Table 5.1, headed Combined Criteria, gives the count of Batch A soldiers with Hands-On or Job Knowledge or MOS Ratings or Army-Wide Ratings or Personnel File Form data.

Hands-On

- Anticipated Variation in Equipment
- Unanticipated Variation in Equipment
- Soldiers Not Available for Part or All of Scheduled Time
- Equipment Breakdown or Non-availability
- Conditions Preventing Testing of Some Soldiers on Some Tests
- Scorer or Scoresheet Error

Ratings Data

- No Suitable Raters Available
- Soldier Does Not Perform Some Kinds of Tasks
- Rater Not Following Instructions
- Combat Rating Not Collected for Females

Job/School Knowledge Test

- Soldiers Not Available for Part or All of Scheduled Time
- Soldiers Exceptionally Slow in Taking Test
- Soldiers Not Following Instructions

Figure 5.1. Reasons why data were incomplete.

From these tables, the number of soldiers for whom data on a particular instrument were totally missing can be determined--that is, soldiers not available for a particular testing session. For example, only 890 of the 909 MOS 11B examinees participated in Hands-On testing.

Treatment of Missing Data

Within a particular instrument, data can be missing for individual measures in the tests. As was shown in Figure 5.1, there were various reasons for these missing data. For example, in the Hands-On testing, pieces of equipment that were needed to perform the task could be missing or non-functioning, which precluded scoring for one or more steps of the task. In the written tests, soldiers might skip over questions they could not answer or might not complete the test within the allotted time. Raters may have felt unable to comment on unobserved performance. When completing self-reports, soldiers might leave questions unanswered if they did not know or did not want to provide the requested information.

Within instruments, various methods were used to deal with partially missing data. For some instruments, the missing data were left as missing and no efforts were made to reconstruct the data. Instruments for which missing data for examinee responses were not reconstructed include Personnel File Form, Job History, Job Satisfaction, and Physical Requirements. For the other instruments, data were reconstructed one instrument at a time, sometimes in multiple stages. Following is an instrument by instrument description of the treatment of missing data.

Table 5.1

LVI Sample Sizes for Performance Measures for Batch A MOS

MOS		Total	Hands-On	Job Knowledge	Army-Wide Ratings	MOS Ratings	Combat Ratings	Job History[a]	Personnel File[b]	Job Satisfaction	Physical Requirements		Combined Criteria[d]
											Incumbent[c]	Supervisor	
11B	Infantryman	909	890	895	899	899	898	905	906	902	904	801	907
13B	Cannon Crewman	916	773	810	897	897	897	916	916	908	914	762	916
19E	M60 Armor Crewman	249	243	248	241	241	241	249	249	247	249	215	249
19K[e]	M1 Armor Crewman	824	749	812	782	778	782	823	819	798	821	617	825
31C	Single Channel Radio Operator	529	446	504	497	481	442	498	527	522	517	427	529
63B	Light-Wheel Vehicle Mechanic	752	624	723	728	719	666	750	750	740	750	674	752
71L	Administrative Specialist	678	641	664	634	626	199	665	675	668	674	594	678
88M	Motor Transport Operator	682	588	674	666	663	479	680	680	673	670	550	682
91A	Medical Specialist	824	794	798	807	797	670	816	818	811	770	582	824
95B	Military Police	452	444	446	451	450	366	452	452	450	438	336	452
Total		6,815	6,192	6,574	6,602	6,547	5,640	6,754	6,792	6,719	6,707	5,558	6,814

[a] One record in the Job History data does not match the link file.

[b] One record in the Personnel File Form data does not match the link file.

[c] Six records in the Physical Requirements (incumbent) data do not match the link file.

[d] Combined Criteria include Hands-On, Job Knowledge, Army-Wide Ratings, MOS Ratings, or Personnel File Form.

[e] One soldier who appears in the 19K Job Knowledge data is designated as 51B in the link file.

Table 5.2

LVI Sample Sizes for Performance Measures for Batch Z MOS

MOS		Total	Job Knowledge	Army-Wide Ratings	Combat Ratings	Personnel File[a]	Job Satis-faction	Physical Requirements: Incumbent[b]	Physical Requirements: Supervisor
12B	Combat Engineer	841	840	827	827	838	835	836	753
16S	MANPADS Crewman	472	471[c]	468	468	472	467	471	406
27E	Tow/Dragon Repairer	90	90	89	84	90	90	90	84
29E	Comm.-Electronics Radio Repairer	112	111	106	101	111	110	111	101
51B[d]	Carpentry/Masonry Specialists	213	212	193	190	212	211	210	169
54B	NBC Specialist	499	498	492	462	498	495	499	421
55B	Ammunition Specialist	279	279	269	243	279	27[illegible]	279	23[illegible]
67N	Utility Helicopter Repairer	197	194	193	192	197	197	195	137
76Y	Unit Supply Specialist	788	788	734	616	787	784	787	668
94B	Food Service Specialist	832	932	818	717	931	822	827	605
96B	Intelligence Analyst	128	128	122	103	128	128	127	106
Total		4,451	4,443	4,311	4,003	4,443	4,417	4,432	3,687

[a] One record in the Personnel File Form data does not match the link file.

[b] Six records in the Physical Requirements (Incumbent) data do not match the link file.

[c] One duplicate SSN is in the file, but the item-level data are different for the two records.

[d] One soldier appears in the 19K Job Knowledge data but is designated as 51B in the link file.

Rules and Procedures for Eliminating Cases

Hands-On Measures

Hands-on testing consisted of observing performance on MOS-specific or general soldiering tasks. Tasks were made up of varying numbers of steps. Within particular tasks, varying amounts of data were missing at the step level. Tables detailing the amount of missing data for each task in each MOS are recorded in Appendix B.

For the most part, there was little missing data--less than 5 percent of the records for most steps. Where there were significant amounts of missing data, the reason was generally missing or damaged equipment. For example, in the task, Put On/Wear MOPP Gear, soldiers often did not have one or all of the pieces required.

At the step level, missing data were imputed using a procedure originally developed for the National Center for Education Statistics (now the Center for Education Statistics). The procedure was developed using the Statistical Analysis System (SAS) software and was called PROC IMPUTE (Wise & McLaughlin, 1980). The details of how the imputation procedure works are described in the concluding section of this chapter.

Within certain MOS, some tasks were treated separately. For the MOS 11B task, Day and Night Surveillance, and the MOS 71L task, Typing Speed, data were not imputed at the step level. These tasks did not have step-level data like the other tasks, but rather were calculated as total scores at the step level, that is, total number of targets located, and total number of words per minute.

The task, Put On/Wear MOPP Gear, was a problem at many locations. For this task, soldiers often did not have all of the equipment needed to perform the entire task. The individual equipment items included trousers, jacket, boots, gloves, and mask. Because individual pieces could be missing, some scorers scored the performance measures for that piece by having the examinee pantomime or describe the correct procedure. Others marked the score sheet "Not Applicable" and scored only those sections where the examinee actually had the gear. Rather than penalize the soldier for the entire task because of a missing piece of equipment, soldiers were given credit for completing the task and missing data were imputed, if they actually performed two of the three parts of the task.

The task, Set Headspace and Timing on an M2 Caliber.50 Machinegun, was tested only on mechanized infantry for MOS 11B. Our data did not include an indicator of mechanized vs. non-mechanized infantry. Therefore, if this task was administered at a particular site, we assumed everyone at that site was required to perform this test. Where the task was not administered, we did not attempt to impute data.

Using the imputation procedure, data were reconstructed for all examinees with missing data. Using this complete step-level data, task scores were calculated as the percentage of steps the examinee performed correctly. However, if an examinee's task score was based on more than approximately 15 percent imputed data, the task score was set to missing. The amount of missing step-level data allowed per task varied, and ranged from 15 to 21

percent. For the most part, however, to receive a task score at this point in the process, examinees' scores had to be based on 85 percent "real"--that is, non-imputed--data at the step level.

The amount of missing task-level data after imputing the step level and calculating task scores is shown in Table 5.3. Some MOS have tracked tasks, for example, 13B, in which a soldier can work with one of three howitzers, M109, M110A2, or M198. Differences in howitzer model necessitate differences in the specific tasks. So while all examinees perform 16 tasks, five of the tasks are designed to be specific to the howitzer type. In Table 5.3, the amount of task- level missing data is separated by those tasks which everyone in an MOS performs in the same fashion, Common Tasks, and those which are individualized because of equipment differences, Tracked Tasks. For MOS 13B data, there are three columns to differentiate the tracked tasks, but the amount of missing data for those tasks that are not tracked is given only once.

The task number as listed in the table has no meaning except to mark the row. It has no significance within any MOS. Row 1 is merely the first task that is listed for any MOS, and that first task may be different for each MOS, or for successive samples.

Task scores were imputed using the same imputation procedure that was used for steps within tasks. At this point, examinees were deleted from the data set if they had too many tasks with scores derived from imputed data. By MOS, soldiers were removed from the data set if they had three to five tasks based on more than 15 percent imputed step-level data. Therefore, cluster scores and CVBITS scores were calculated only for soldiers who had 85 percent of their task scores based on approximately 85 percent real data.

Table 5.4 shows comparable missing data from the Concurrent Validation First-Tour (CVI) data. Again, note that the task number on Tables 5.3 and 5.4 is used only to mark the row. Between the two tables, the tasks may not be in the same order within MOS. In addition, there were changes in the tasks between the two data collections. Some tasks were dropped, some tasks were added, and some tasks were updated to reflect the most current training methods. Despite these differences in detail, the patterns of missing data at the task level can be compared in the two tables.

This comparison is presented in Table 5.5, which shows that the patterns of missing data at the task level were fairly similar between the CVI data collection and the LVI data collection. Overall, there appears to be somewhat more missing data for the LVI sample than for the CVI sample. The average percentage missing per task for LVI MOS ranges from 1.62 to 13.91, and for CVI MOS ranges from 0.05 to 10.71. The means of these MOS averages are 7.03 percent for LVI and 3.83 percent for CVI. Within some MOS, there are specific tasks with large amounts of missing data, generally because of equipment failures, but most tasks are missing less than 5 percent of the data (76 of 139 tasks have less than 5 percent missing data).

Table 5.3

LVI Hands-On Data: Amount of Missing Data at the Task Level After Step-Level Imputes Have Been Made, by MOS (percent)

Task	11B*	13B	13B	13B	19E	19K	19K	31C	31C	63B	71L	88M	91A	95B	95B	95B
Common Tasks																
1	1.12	5.06			.00	3.62		6.73		3.21	1.34	3.03	.25	.45		
2	.78	1.73			.00	5.87		9.31		2.93	8.04	1.36	12.05	.90		
3	.56	1.98			.00	1.62		8.12		.42	2.08	1.51	.63	1.12		
4	3.46	4.69			11.74	32.58		36.24		49.02	26.93	6.05	.25	.67		
5	1.01	.99			.81	2.50		9.31		3.49	7.29	5.60	.25	1.35		
6	2.35	.49			.00	4.49		9.50		16.06	6.85	16.64	1.88	.90		
7	19.55	5.56			.40	2.75		13.27		6.56	4.46	3.33	1.00	15.96		
8	7.49	14.07			1.62	1.62		22.38		23.18	5.36	3.18	.88	38.20		
9	2.23	1.11			.00	3.37		13.47		7.96	6.55	26.93	1.88	10.56		
10	2.01	5.19			3.24	3.50		8.51		18.44	4.76	21.79	.63	.22		
11	.78	3.58			2.43	1.37		10.10		9.08	5.36	5.90	3.89	.90		
12	3.24				1.21	2.37		10.69		16.62	1.01	5.14	1.00	.45		
13	1.12				.00	3.75		11.09		23.88	1.19	15.28	4.02			
14					1.62			30.30				16.34				
15					1.21							15.39				
Tracked Tasks																
16		3.13	3.73	8.05		2.47	4.44	.00	10.92					4.76	5.26	.00
17		3.92	3.76	8.05												
18		3.14	34.80	7.20												
19		2.35	18.50	8.47												
20		10.98	13.48	14.11												

Note: The task number does not designate the same task for each MOS, and is used only to identify the row.

* The task, Set Headspace and Timing on an M2 Caliber .50 Machinegun, not imputed at the task level.

Table 5.4

CVI Hands-On Data: Amount of Missing Data at the Task Level After Step-Level Imputes Have Been Made, by MOS (percent)

Task	11B	13B	13B	13B	13B[a]	19E	31C	63B	64C[b]	71L	91A	91A	95B	95B
Common Tasks														
1	.43	2.31				.61	.85	.97	6.94	.59	.00		1.16	
2	.58	4.00				.81	1.13	3.06	17.28	4.53	.00		1.16	
3	1.88	1.54				.41	3.10	2.74	.59	.59	.00		1.16	
4	.72	6.78				6.73	1.69	8.05	.89	10.43	.00		1.74	
5	.72	6.47				.61	5.92	4.03	3.40	2.56	.00		3.19	
6	1.45	.61				.82	1.13	3.70	4.43	2.56	.00		2.32	
7	1.01	2.31				.61	3.38	6.12	39.73	1.77	.40		4.93	
8	3.98	7.55				1.84	5.35	8.21	8.12	1.77	.00		3.77	
9	1.88	2.93				.61	6.76	6.12	40.18	2.76	.00		4.20	
10	1.59	.46				2.86	24.79	10.93	3.69	1.57	.00		2.32	
11	1.01	.92				2.86	4.23	7.25	3.99	1.97	.00		2.90	
12	15.36	1.39				2.45	4.51	5.15	3.99	2.36	.00		2.75	
13		1.54				.41	4.23	9.98	8.12	1.97	.40		.87	
14						2.04	2.25	4.35	9.45				2.03	
15							3.38	8.53	9.90				2.32	
Tracked Tasks														
16	.99	1.51	3.85	.00	3.23	1.69					.00	.00	2.51	21.15
17		1.81	3.30	.00	4.84						.00	.00		
18		5.12	3.30	.00	1.61									
19		11.14	7.69	2.74	17.74									

Note: The task number does not designate the same task for each MOS.

[a] Track M102 is included in CV1 missing data counts, but was not included in LV1 missing data counts.
[b] MOS 64C became MOS 88M.

Table 5.5

Comparison of Missing Hands-On Task-Level Data in the LVI and CVI Data Collections

MOS	Percent of Data Missing (Mean/Standard Deviation) LVI	CVI
11B	3.52/ 4.96	2.43/ 3.84
13B (common)	4.04/ 3.64	2.99/ 2.36
13B (tracked)	9.58/ 8.17	3.37/ 3.20[a]
19E	1.62/ 2.87	1.69/ 1.60
19K[b]	5.09/ 7.44	
31C	13.12/ 8.81	4.85/ 5.61
63B	13.91/12.68	5.95/ 2.76
71L	7.02/ 6.33	2.73/ 2.42
88M[c]	9.86/ 7.89	10.71/12.15
91A	2.20/ 3.09	0.05/ 0.13
95B	5.45/ 9.79	3.56/ 4.53
Overall	7.03/ 4.19[d]	3.83/ 2.76

[a] Excludes track M102, which was not collected in LVI.
[b] Not collected during CVI.
[c] Collected as MOS 64C in CVI.
[d] Excludes 19K.

Job Knowledge/School Knowledge

The job knowledge and school knowledge test data were processed using similar methods. In these tests, there were two reasons for partial missing data. First, an examinee might skip over individual questions within a test, and second, an examinee might not complete the test. The procedure used was to determine the total amount of missing data, and then to reconstruct data only for those missing less than 10 percent of the data. Tables 5.6 and 5.7 show by MOS the counts of soldiers with missing data for job knowledge and school knowledge tests, respectively.

In addition to determining how much missing data an examinee had for the test, we also determined those who appeared to be randomly responding to the test. A random response index was defined as the correlation between the item score (1 for correct and 0 for incorrect) and item difficulty expressed as the proportion of subjects who answered the item correctly. For most examinees, the correlation was positive since there was a tendency to get the easier items correct and miss the more difficult items. In a few instances this correlation was essentially zero, suggesting random responding. The records for those individuals were flagged. We did not, however, delete any examinee records for suspected random responding. Only those who were missing more than 10 percent of the items had their scores deleted from the job knowledge data or the school knowledge data.

Table 5.6

Number of LVI Cases With Incomplete Job Knowledge Data for Batch A MOS

MOS	None Missing	Less Than 10% Missing	More Than 10% Missing
11B	677	218	12
13B[a]	614	280	11
19E	198	50	1
19K	619	194	11
31C	377	127	24
63B	523	200	29
71L	243	421	14
88M	541	133	7
91A	595	203	26
95B	332	114	6

[a] 13B includes 84 examinees for howitzer M102 who were dropped from the final analysis data.

Table 5.7

Number of LVI Cases With Incomplete School Knowledge Data for Batch Z MOS

MOS	None Missing	Less Than 10% Missing	More Than 10% Missing
12B	828	7	6
16S	460	9	3
27E	85	3	2
29E	94	5	13
51B	206	1	6
54B	480	17	2
55B	273	3	3
67N	190	7	0
76Y	760	17	11
94B	819	12	1
96B	122	1	5

In most cases, examinees finished the job knowledge test. Those with missing data were individuals who had skipped over sections of the test. Because the amount of not-reached items was so small, it was decided to leave any of those missing items as missing. Items which were skipped within the test were reconstructed by assigning a value equal to the chance score. For example, if a question had five response choices, the examinee had a .2 chance of responding correctly.

The imputation procedure was used for only three tasks within the job knowledge tests. The questions for these tasks were not administered at all sites. Figure 5.2 gives the tasks for which data were imputed.

MOS	TASK	Description
11B	XKG3	Identify Friendly/Threat Vehicles. This task was only administered at only half of the sites. The data were imputed for all other sites.
63B	HKI2	Expedient Repairs. This task was not administered at Fort Bragg. The data for that site were imputed.
71L	AKHI	File Documents with MARKS. Items 4-6 of this task were not administered at all sites. The data for those sites missing the items were imputed.

Figure 5.2. Tasks with imputed data in the Job Knowledge tests.

Ratings Data

The Army-wide ratings and the MOS-specific ratings were the only ones used in the combined criteria files. Combat ratings were not included because they were not administered to all examinees; only males were rated on the combat dimensions.

Ratings were processed identically for both Army-wide and MOS ratings. For each examinee, the ratings received on the individual dimensions were averaged for peer ratings separately from supervisor ratings. To provide combined scores, mean differences between peer and supervisor ratings on each dimension were eliminated by subtracting the peer mean from the supervisor mean and dividing the result by 2; the absolute value was then subtracted from the higher mean, whether peer or supervisor, and added to the lower mean. These corrected dimension means were then averaged to provide the combined dimension means.

Overall means were calculated as the mean of all dimensions for peers, supervisors, and combined. In addition, for the Army-wide ratings, three factor scores were calculated as the means of specific dimensions. These factor scores were Technical Skill and Effort, Integrity and Self-Control, and Appearance.

If an examinee was missing data on more than 20 percent of the individual dimensions for peers or for supervisors, the overall scores for that rater type were set to missing, and the combined scores were recalculated to reflect only the remaining scores.

Combined Criteria

Data for each individual performance measure were processed individually. After processing was completed for these individual measures, they were combined so that all performance data for each examinee were included in a single file. The data were combined separately by MOS.

Data for the Batch A MOS were combined in order to calculate first the basic scores and second the overall criterion scores. By MOS, the various criterion files were combined by including all examinees who were in the Hands-On or Job Knowledge or Army-Wide ratings or MOS ratings or Personnel File Form data. Presence in any individual file defined presence in the combined file.

When the data were combined, basic scores were calculated for the individual performance measures. Basic scores are scores that are derived from each individual type of data. Table 5.8 shows the basic scores that were calculated for the five types of performance data. It also shows, by instrument and MOS, the amount of missing data present for the basic scores after the files were combined. For the Hands-On and Job Knowledge CVBITS scores, dash marks indicate where a particular score was not calculated for that MOS. The imputation procedure was used to construct the missing basic scores. Each MOS was imputed separately.

Five overall criterion scores were calculated for each examinee. These scores are General Soldiering Proficiency, Core Technical Proficiency, Effort and Leadership, Maintaining Personal Discipline, and Physical Fitness and Military Bearing. (The Core Technical Proficiency score was not calculated for examinees in MOS 11B because it correlates highly with General Soldiering Proficiency.) These scores are derived from the basic scores and represent the highest level scores for the performance data.

Criterion scores were calculated only where there was less than 50 percent imputed data at the basic score level for those scores included in the individual criterion score. For example, for MOS 11B, the Effort and Leadership score was calculated from four of the basic scores. If an examinee had imputed data for two or more of the basic scores, the Effort and Leadership score was not calculated.

Table 5.9 shows the amount of missing data in the final sets. These data sets are referred to as the "combined criteria data" because they include all of the overall criterion scores.

LV PREDICTOR DATA

In addition to the performance data, missing Longitudinal Validation predictor data were also imputed. For a complete description of the editing process used on the predictor data, see the FY90 Annual Report. The bulk of the editing process was accomplished during FY90, but additional work was done during FY91.

As described in the FY90 Annual Report, scale-level scores were calculated using the same methods as had been used during the CV analyses. A scale-level score is the score or scores derived from an individual test; for example, 15 scale scores were calculated from the ABLE test. At the time, due to a change

Table 5.8

LVI Combined Criteria Data: Amount of Missing Data for Basic Scores, by MOS (percent)

Criteria	11B	13B	19E	19K	31C	63B	71L	88M	91A	95B
MOS Ratings										
Overall MOS Rating	1.32	5.35	3.21	6.67	9.83	4.65	9.73	4.55	6.43	1.55
Personnel File Form										
Awards, Memos, and Certificates	2.43	3.60	2.01	3.76	4.91	3.19	2.65	2.79	2.91	1.77
Articles 15 and Flags	1.21	1.53	.00	1.82	1.51	1.06	1.18	.73	1.94	.44
Physical Readiness Score	4.63	5.46	3.21	5.21	9.45	11.44	9.00	9.09	6.55	5.31
M16 Qualification	2.65	4.04	29.32	18.30	2.65	3.19	1.77	2.93	3.88	3.98
Grade Deviation Score	1.76	1.86	.80	4.00	5.10	4.79	5.01	3.96	2.67	0.88
Army-Wide Ratings										
Overall Effectiveness	1.10	2.95	3.21	5.33	6.99	3.32	7.67	2.79	2.31	.22
F01 - Technical Skill and Effort	.88	2.07	3.21	5.21	6.05	3.19	6.93	2.35	2.06	.22
F02 - Integrity and Self-Control	.88	2.07	3.21	5.21	6.05	3.19	6.93	2.35	2.06	.22
F03 - Appearance	.88	2.07	3.21	5.21	6.05	3.19	6.93	2.35	2.06	.22
Hands-On - CVBITS										
C - Communications	1.87	15.61	2.41	9.21	15.69	--	--	--	--	--
V - Vehicles	--	--	--	--	15.69	17.02	--	13.78	--	1.77
B - Basic Soldiering	1.87	15.61	2.41	9.21	15.69	17.02	5.46	13.78	3.64	1.77
I - Identify Targets	--	--	--	--	--	--	--	--	--	--
T - Technical	--	15.61	2.41	9.21	15.59	17.02	5.46	--	3.64	1.77
S - Safety/Survival	1.87	15.61	2.41	9.21	15.69	17.02	5.46	13.78	3.64	1.77
Job Knowledge - CVBITS										
C - Communications	2.65	12.01	.40	1.94	6.62	--	--	--	--	1.55
V - Vehicles	--	--	--	--	6.62	5.05	--	1.91	4.98	1.55
B - Basic Soldiering	2.65	12.01	.40	1.94	6.62	5.05	2.36	1.91	4.98	1.55
I - Identify Targets	2.65	12.01	.40	1.94	6.62	--	--	1.91	4.98	1.55
T - Technical	--	12.01	.40	1.94	6.62	5.05	2.36	--	4.98	1.55
S - Safety/Survival	2.65	12.01	.40	1.94	6.62	5.05	2.36	1.91	4.98	1.55

Note. -- indicates that the particular score was not calculated for that MOS.

Table 5.9

LVI Combined Criteria Data: Amount of Missing Data for Final Scores, by MOS (percent)

	11B	13B	19E	19K	31C	63B	71L	88M	91A	95B
General Soldier Proficiency	.0	9.5	.0	.4	1.9	.7	.6	.1	.4	.0
Core Technical Proficiency[a]	-	9.5	.0	.4	1.9	.7	.6	.1	.4	.0
Effort and Leadership	1.2	3.1	3.2	5.3	7.4	3.5	7.7	2.8	2.4	.2
Maintain Personal Discipline	.0	.2	.0	.2	.6	.4	.9	.3	.1	.0
Physical Fitness and Bearing	.0	.0	.0	.1	.4	.3	.7	.3	.0	.2

[a] Core Technical Proficiency was not calculated for MOS 11B.

in the software version of SAS available on the NIH computer, the imputation procedure was not available. We were using a version that was written for the PC. The practical implication of this limitation was that we could not use the entire predictor data set in imputing the missing values. Downloading the data from the mainframe to the PC would have been too time consuming and expensive.

The predictor data consisted of paper-and-pencil tests and computer-administered tests. The paper-and-pencil tests included:

Spatial Tests	Non-Spatial Tests
Orientation Test	ABLE
Map Test	AVOICE
Assembling Objects Test	JOB
Reasoning Test	
Object Rotation Test	
Maze Test	

The computer-administered tests included:

Simple Reaction Time	Perceptual Speed and Accuracy
Choice Reaction Time	Number Memory
Short-Term Memory	Cannon Shoot
Target Tracking 1	Target Identification
Target Tracking 2	Target Shoot

The scale scores for the paper-and-pencil tests and the computer-administered tests were imputed separately, although the same methodology was used. The paper-and-pencil scale scores were imputed first.

Paper-and-Pencil Tests

The paper-and-pencil tests yielded 65 scale scores: 15 ABLE scale scores, 23 AVOICE scale scores, 7 JOB scale scores, 14 alternate ABLE factor scores[1], and 6 spatial test scores. Scale scores for individual tests were combined to create composite scores, which convert the scale scores into overall scores for each test. There are seven ABLE composites, eight AVOICE composites, three JOB composites, and one spatial composite. Not all of these scale scores were used in creating composite scores, however. Table 5.10 shows the amount of missing data for those scale scores used to create composite scores. These scores were the only ones used during the imputation process for the predictor data.

Because of the large number of records in the file (49,408 observations in the total file), it was decided to use a sample of records to impute the missing data rather than the entire file. First, all records in which data were missing for at least one of the scale scores were flagged to be included in the imputation sample. (Records missing all scale scores had no data imputed.) Second, a random sample of half of the observations in the file were also flagged for use in imputing the missing data. To select records for the random sample, the data were sorted by MOS, gender, race, and AFQT score. Then, every other record was flagged for inclusion in the sample. Because some of the records flagged as having missing data could also have been flagged as part of the random sample, the final sample used for imputation consisted of 27,112 records. These records were written out as raw data files and downloaded to the PC for imputation.

The data were imputed battery by battery. That is, only ABLE data were used to impute ABLE data, only AVOICE data were used to impute AVOICE data, and so forth.

After the imputed scale score data were added to the files, the scale scores were standardized to a mean of 50 and a standard deviation of 10. Composite scores were then calculated using the standardized scale scores. Composite scores were calculated only where 50 percent or more of the data in the scale scores included in the composite was "real" rather than imputed.[2]

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[1] These alternate ABLE factor scores (ABLE-168 and ABLE-114) are equivalent to scale scores, but are still being studied for their inclusion in analyses. These scores were not imputed and were not used to calculate composite scores.

[2] There are three levels of "scores" in the paper-and-pencil predictor data: (a) examinee responses, (b) scale scores, and (c) composite scores. Examinee responses were not imputed, so scale scores that are derived from those responses could be missing. Missing scale scores were imputed in order to calculate composite scores; however, if 50 percent or more of the scale scores that made up any individual composite score were imputed, the composite score was not calculated.

Table 5.10

LVI Predictor Data: Amount of Missing Data for Paper-and-Pencil Scale Scores

Score	Not Missing	Missing
Assembling Objects - Number Correct	49,042	366
Map - Number Correct	49,047	361
Maze - Number Correct	49,052	356
Object Rotation - Number Correct	49,103	305
Orientation - Number Correct	49,072	336
Reasoning - Number Correct	49,103	305
JOB Scale 1 - Pride	46,525	2,883
JOB Scale 2 - Job Security/Comfort	46,634	2,774
JOB Scale 3 - Serving Others	46,295	3,113
JOB Scale 4 - Job Autonomy	46,037	3,371
JOB Scale 5 - Routine	45,975	3,433
JOB Scale 6 - Ambition	46,058	3,350
ABLE Scale 1 - Emotional Stability	44,264	5,144
ABLE Scale 2 - Self-Esteem	44,247	5,161
ABLE Scale 3 - Cooperativeness	44,258	5,150
ABLE Scale 4 - Conscientiousness	44,199	5,209
ABLE Scale 5 - Nondelinquency	44,228	5,180
ABLE Scale 6 - Traditional Values	44,190	5,218
ABLE Scale 7 - Work Orientation	44,260	5,148
ABLE Scale 8 - Internal Control	44,254	5,154
ABLE Scale 9 - Energy Level	44,217	5,191
ABLE Scale 10 - Dominance	44,246	5,162
ABLE Scale 11 - Physical Condition	44,264	5,144
AVOICE Scale 1 - Clerical/Administrative	45,477	3,931
AVOICE Scale 2 - Mechanics	45,941	3,467
AVOICE Scale 3 - Heavy Construction	45,851	3,557
AVOICE Scale 4 - Electronics	45,922	3,486
AVOICE Scale 5 - Combat	45,939	3,469
AVOICE Scale 6 - Medical Services	45,545	3,863
AVOICE Scale 7 - Rugged Individualism	45,944	3,464
AVOICE Scale 8 - Leadership/Guidance	45,508	3,900
AVOICE Scale 9 - Law Enforcement	45,958	3,450
AVOICE Scale 10 - Food Service Professional	45,916	3,492
AVOICE Scale 11 - Firearms Enthusiast	45,942	3,466
AVOICE Scale 12 - Science/Chemical	45,970	3,438
AVOICE Scale 13 - Drafting	45,976	3,432
AVOICE Scale 14 - Audiographics	45,452	3,956
AVOICE Scale 15 - Aesthetics	45,279	4,129
AVOICE Scale 16 - Computers	45,554	3,854
AVOICE Scale 17 - Food Service Employee	45,965	3,443
AVOICE Scale 18 - Mathematics	45,691	3,717
AVOICE Scale 19 - Electronic Communications	45,602	3,806
AVOICE Scale 20 - Warehousing/Shipping	45,963	3,445
AVOICE Scale 21 - Fire Protection	45,972	3,436
AVOICE Scale 22 - Vehicle Operator	45,971	3,437

Computer-Administered Tests

The computer battery yielded 17 scale scores. Table 5.11 shows the amount of missing data for those scores.

Table 5.11

LVI Predictor Data: Amount of Missing Data for Computer-Administered Scale Scores

Score	Not Missing	Missing
Target Identification - Mean of Clipped Decision Time	38,401	513
Target Identification - Proportion Correct	38,404	510
Number Memory - Mean of Clipped Operation Means	38,324	590
Number Memory - Proportion Correct	38,353	561
Target Track 1 - Mean Log (Distance+1)	38,825	89
Target Track 2 - Mean Log (Distance+1)	38,793	121
Cannon Shoot - Mean Absolute Time Discrepancy	38,603	311
Target Shoot - Mean Log (Distance+1)	37,477	1437
Mean of Median Movement Times across 5 tests	37,863	1051
Simple Reaction Time - Median Decision Time	38,747	167
Simple Reaction Time - Proportion Correct	38,747	167
Choice Reaction Time - Median Decision Time	38,856	58
Choice Reaction Time - Proportion Correct	38,856	58
Perceptual Speed/Accuracy - Mean of Clipped Decision Time	38,703	211
Perceptual Speed/Accuracy - Proportion Correct	38,734	180
Short-Term Memory - Mean of Clipped Decision Time	38,483	431
Short-Term Memory - Proportion Correct	38,490	424

Because of the large number of records in the file (38,914 observations in the total file), it was decided to use a sample of records to impute the missing data rather than the entire file. First, all records in which data were missing for at least one of the scale scores were flagged to be included in the imputation sample. (Records missing all scale scores had no data imputed.) Second, a random sample of half of the observations in the file were also flagged for use in imputing the missing data. To select records for the random sample, the data were sorted by MOS, gender, race, and AFQT score. Then, every other record was flagged for inclusion in the sample. Because some of the records flagged as having missing data could also have been flagged as part of the random sample, the final sample used for imputation consisted of 20,273 records. These records were written out as raw data files and downloaded to the PC for imputation.

Unlike the paper-and-pencil predictor data which were imputed separately by battery, all computer scale scores were imputed together. As stated earlier, for the paper-and-pencil data, for example, only ABLE data were used to impute ABLE data. In the computer data, all scale score information was used to impute any missing scale scores.

After imputation, the scale scores were standardized to a mean of 50 and a standard deviation of 10. Using the standardized scale scores, eight composite scores were calculated where the examinee had 50 percent of more non-imputed scale score data.[3]

SCORE IMPUTATION

In any data analyses, the more data one is able to collect, the more complete those analyses will be. Extensive efforts had been made during the LVI data collection process to obtain complete data across instruments and within instruments for each examinee. While building the analysis data sets, extensive efforts were made to retain the data for as many examinees as possible.

An imputation procedure was developed that used existing data to estimate values for missing data. This procedure, described below, was used in the CVI analyses to develop performance scores for a very high proportion of soldiers tested (Wise, McHenry, & Young, 1986). The decision rules and imputation procedures used in the CVI analyses were replicated in the LVI analyses as closely as possible. In this way, it was possible to develop performance scores for a very high proportion of the LVI soldiers tested.

The Imputation Procedure

A procedure known as PROC IMPUTE was developed for the National Center for Education Statistics (now the Center for Education Statistics) (Wise & McLaughlin, 1980). PROC IMPUTE uses regression estimates to predict missing values. Each missing value is predicted from other values for the subject in question so that individual differences are retained. The regression coefficient and intercept vary from item to item so that differences in item difficulty are also reflected in the predicted values. PROC IMPUTE adds a random variable with variance equal to the error of estimate for predicting the missing value. If such a random variable is not added, the imputed values are more highly correlated with values on other variables in comparison with nonimputed values.

PROC IMPUTE employs a sequential strategy that maintains relationships between variables when more than one value is imputed for the same examinee.

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[3]There are three levels of "scores" in the computer predictor data: (a) examinee responses, (b) scale scores, and (c) composite scores. Examinee responses were not imputed, so scale scores that are derived from those responses could be missing. Missing scale scores were imputed in order to calculate composite scores; however, if 50 percent or more of the scale scores that made up any individual composite score were imputed, the composite score was not calculated.

A two-stage approach is used, with the first variable imputed from nonmissing values. The second (and subsequent) variable(s) is imputed from the nonmissing values plus the imputed value for the first variable. After all initial imputations, values are reimputed in a second pass where all of the initially imputed values participate in the reimputation of each missing value.

PROC IMPUTE rests on having good estimates of the correlations among the variables. Experience in the imputation of missing values has led to the formulation of three guiding principles: (a) no more than 50 variables at a time should be imputed; (b) the examinee sample size should be large enough to obtain reasonable estimates of the correlations; and (c) the amount of missing data for a variable should not be excessive. In general, the larger the examinee sample size and the smaller the proportion of missing data, the better the estimates of the imputed values.

Imputation was employed at several levels, as was detailed earlier in this chapter. In the Hands-On data, missing steps scores were imputed so that task scores could be computed. Missing task scores were then imputed from existing task scores. Missing Job Knowledge test scores were imputed for selected tests from existing Job Knowledge scores. Missing criterion scores were imputed across all instruments: Hands-On, Job Knowl[illegible], Army-Wide Ratings, MOS Ratings, and Personnel File Form. (For the Personnel File Form, individual examinee responses were not imputed; however, basic scores for the Personnel File Form were imputed for use in calculating overall criterion scores.)

In the Hands-On data, several issues arose that were caused by the nature of the data. At the step score level, some tasks had more than 50 variables. (The problem with the number of variables is described in more detail below.) For example, in MOS 31C, there were 73 steps for the task, Operate TTY GRC-142. The approach we chose was to run PROC IMPUTE twice. The first run imputed all the odd-numbered steps and the second run imputed all the even-numbered steps. In MOS 13B, the task, Put on/Wear M25 Mask, contained six steps and had only 16 observations missing two data points Since this task involved an alternative face-mask, we choose to combine this task with the face-mask task performed by the majority of examinees (Put on/Wear M17 Mask).

At the task score level, we ran into an issue with imputing data on "tracked" task scores. Tracked tasks occurred when a soldier worked on one of several alternative systems. For example, in MOS 13B, a soldier might work on one of three howitzer types. While all soldiers performed common tasks, specific tasks were associated with each howitzer model. Soldiers had data on their particular model on which they were tested, but not on the others. Characteristic to tracked tasks is the high percentage of missing data when all the soldiers are considered. Thus, imputing the scores on these tasks is problematic. It also seemed illogical to impute scores on soldiers who were not on the track containing the task. The approach we took was to use a two-stage imputation process. First, the tasks common to all examinees across all tracks were imputed to create full data on the common tasks. Then the total sample on the MOS was separated into subsamples of soldiers who represented the different tracks. The second stage of the imputation was run on each subsample separately, using the imputed common tasks and the specific tracked tasks to be imputed.

Imputation at the basic score level (those scores listed in Table 5.8) was fairly straightforward. Sample sizes ranged from 249-907, the number of variables ranged from 16-21, and the amount of missing data ranged from 0-17 percent. The relatively large samples combined with the generally low percentage of missing data yielded fairly good estimates of the inter-correlations among the criteria. Since the number of variables was 21 or less, only one pass through the imputation procedure was necessary.

Examining the Results of Imputation

The results of the imputation were examined at two levels. First, after each PROC IMPUTE run, the program output was inspected. Second, the pre-imputed and the post-imputed data sets were compared. The process for accomplishing this examination is briefly described below.

Inspection of Program Output

The PROC IMPUTE output provides five reports for use in evaluating the results: (1) missing data frequencies and univariate statistics, (2) characteristics of cases with missing values, (3) correlations between reported values, (4) regression equations, and (5) conditional distributions. A sample output for the imputation of step-level data for a Hands-On task in MOS 71L is shown as Appendix C.

Missing data report 1 is examined to verify that the data were read in correctly, and that each variable was not missing an excessive amount of data. It reports for each variable: percent missing data, frequency values of number present, minimum and maximum values, and mean and standard deviation of values. Report 2 describes the relationship of each variable to all other variables in the data set. From the sample output, one of the results can be extracted as follows:

	STEP 1	
STEP 2	59.8183	Mean of Step 1 with cases missing Step 2
	11.2480	Standard deviation of Step 1 with cases missing Step 2
	165	Number of cases missing Step 2 with values for Step 1
	0.232	Phi correlation of missing data flags
	2.305	t significance of difference in Step 1 between cases with Step 2
	0.0018	t significance of difference in Step 1 between cases with no values for Step 2

The third report gives the correlations for the pre-imputed values of all variables. This is calculated prior to the imputation of the data. Report 4 gives the results for the regression equations used in the imputation of each variable. Regression functions are generated only for variables with some missing data. The variables are ordered so as to maximize the total variance accounted for in the prediction of all missing values when each variable is predicted only from preceding variables. This ordering is necessary to ensure that any missing values among the predictor values will have already been filled in before the variable is used as a predictor in a regression function.

The conditional distribution report 5, which shows the cumulative distribution of each target value in each regression value subset, is examined

to verify the reasonableness of the distributions. Among the values it reports are the regressed data value, the frequency with the data target, and the regressed mean variable. Examination of report 5 should show that the frequencies are uniformly distributed over the range of data values, and the regressed mean variable should round to the regressed value. The mean of the imputed values should also be compared with the mean values from report 1.

The imputation results are aberrant when the frequency of data values is greater at the extremes of the distribution (i.e., a U-shaped frequency distribution). In this case, the regressed mean variables are also nonconvergent and become very large. If the results are aberrant, then the imputation procedure may have been affected by the variables with large percentages of missing data. Additional PROC IMPUTE runs may be necessary, excluding these variables from the imputation.

This brief description of the imputation inspection process provides the information necessary for an overall understanding of the procedure. For more detailed information, it is suggested that the reader obtain copies of the reports listed in the references.

Comparison of Data Sets

Two sets of pre- and post-imputation comparisons were made for each MOS: (a) after the hands-on score level imputation, and (b) after the criterion construct level imputation.

The means and variances of the pre- and post-imputation results for the hands-on data were compared for each MOS. An independent *t* was used to examine the difference between means, and an independent *F* of the ratio of variances was used to examine differences between variances. As shown in Table 5.12, the *t*s and *F*s are mostly nonsignificant at the .05 level. The significance of two *t*s and one *F* may have occurred by chance since the algorithm adds random error to the solution. Differences between the pre-imputation correlation matrix and the post-imputation matrix are reported in Table 5.13. The table reports the average root mean square of the difference, the sum of the absolute differences, and the number of correlations overestimated and the number underestimated by PROC IMPUTE. For each MOS, the full intercorrelation matrices of the pre-imputed variables and the residuals for the pre- and post-imputed results, and the pre-imputed and residual means and variances are reported in Appendix D.

A similar analysis was done for the differences between the pre- and post-imputation results for each MOS at the basic score level. Table 5.14 summarizes the results of the *t* and *F* tests for differences between means and variances, respectively. Table 5.15 reports the summary of the differences between the correlation matrices.

Table 5.12

Summary of Difference Tests for Means and Variances for Pre-/Post-Imputation Results on the Hands-On Task Scores

MOS	Number of Tests	Range of *t* Values	Range of *F* Values
11B	13	-.723 - .223	1.007 - 1.183
13B	10	-.138 - .133	1.037 - 1.470
19E	15	-.073 - .092	1.024 - 1.291
19K	13	-.661 - .167	1.002 - 1.344
31C	14	-.263 - .066	1.061 - 1.395
63B	13	-.341 - .223	1.050 - 1.235
71L	13	-.852 - .094[a]	1.047 - 1.235[b]
88M	15	-.872 - .227	1.025 - 1.333
91A	13	-.202 - .189	1.046 - 1.193
95B	12	-.036 - .202[c]	1.000 - 1.163

[a] *t*-test value = -1.698 on Task 12 and 3.881 on Task 13.

[b] *F*-test value = 2.849 on Task 13.

[c] *t*-test value = -1.741 on Task 8.

Table 5.13

Summary of Root Mean Square and Absolute Differences for Pre-/Post-Imputation Results on the Hands-On Task Scores

MOS	RMS	Absolute Difference	Differences >0	Differences <0
11B	.081	.065	51	27
13B	.088	.074	25	20
19E	.073	.056	47	56
19K	.046	.036	35	43
31C	.083	.062	46	45
63B	.064	.050	35	43
71L	.063	.052	53	25
88M	.083	.063	53	52
91A	.070	.056	62	16
95B	.070	.052	32	34

Table 5.14

Summary of Difference Tests for Means and Variances for Pre-/Post-Imputation Results on Basic Scores

MOS	Number of Tests	Range of *t* Values	Range of *F* Values
11B	17	-.014 - .142	1.001 - 1.019
13B	19	-.058 - .181	1.000 - 1.051
19E	19	-.025 - .087	1.000 - 1.031
19K	19	-.099 - .088	1.002 - 1.027
31C	21	-.134 - .167	1.002 - 1.048
63B	18	-.137 - .081	1.001 - 1.026
71L	16	-.042 - .096	1.000 - 1.038
88M	17	-.035 - .098	1.001 - 1.029
91A	18	-.101 - .167	1.000 - 1.045
95B	20	-.119 - .075	1.000 - 1.050

Table 5.15

Summary of Root Mean Square and Absolute Differences for Pre-/Post-Imputation Results on Basic Scores

MOS	RMS	Absolute Difference	Differences >0	Differences <0
11B	.007	.006	66	70
13B	.013	.010	88	83
19E	.021	.014	77	93
19K	.012	.009	46	125
31C	.019	.015	67	143
63B	.015	.011	[illegible]	102
71L	.014	.011	39	81
88M	.013	.009	60	76
91A	.010	.008	68	85
95B	.008	.006	82	108

Conclusions

In terms of absolute size, the residuals summarized in Table 5.15 are quite small. Imputation makes virtually no difference in the magnitude of the intercorrelations among the criterion scores that were used to create the performance factor scores in the validation analyses. At the criterion score level, these results are similar to those obtained earlier from the CV imputation (Wise, McHenry, & Young, 1986). The full results for each MOS are reported in Appendix E.

Chapter 6
DEVELOPMENT OF THE LONGITUDINAL VALIDATION SAMPLE FIRST-TOUR PERFORMANCE MODEL

Scott H. Oppler, Ruth A. Childs, and Norman G. Peterson

A model of first-tour performance in entry-level Army jobs, developed using data from the Project A Concurrent Validation (CVI) sample, has been described by J.P. Campbell, McHenry, and Wise (1990). This model included five performance factors, labeled Core Technical Proficiency (CTP), General Soldiering Proficiency (GSP), Effort and Leadership (ELS), Maintaining Personal Discipline (MPD), and Physical Fitness and Military Bearing (PFB). Definitions for these factors are provided in Figure 6.1. Additionally, the CVI model included two measurement method factors, a Ratings factor and a Paper-and-Pencil Test, or Written, factor. The Ratings factor was intended to represent similarities among performance ratings, while the Written factor represented similarities among performance scores based on paper-and-pencil measures.

The development of the CVI model involved the following steps: (a) developing a set of basic performance criterion scores, (b) assigning these basic variables to five hypothesized performance factors and two hypothesized method factors, and (c) refining the model within and across jobs using confirmatory factor-analytic techniques. Because the model was developed using the CV data, it could not be confirmed using the same data. J.P. Campbell et al. (1990) described their LISREL analyses using these data as "quasi" confirmatory.

The evaluation of the CVI first-tour performance model using data from an independent sample can, however, be considered confirmatory. In this chapter, we report results of analyses aimed at confirming the CVI model, using first-tour performance data collected from the Project A/Career Force Longitudinal Validation (LVI) sample. Additionally, results of comparative analyses aimed at evaluating more parsimonious models of first-tour performance are reported. These analyses were also conducted using the LVI data. Finally, the scoring procedures used to create the LVI criterion construct scores used in the validation analyses reported in Chapter 7 are described.

A CONFIRMATORY TEST

Sample

The CVI model was developed using data from the nine MOS, designated Batch A, for which a full set of criterion measures had been developed (C.H. Campbell et al., 1990). In the LVI sample, there are 10 Batch A MOS, including the nine from the CVI sample plus MOS 19K. (Note that the MOS designation of Motor Transport Operators has been changed from 64C in the CVI sample to 88M in the LVI sample.) All soldiers in the LVI sample with

1. Core Technical Proficiency (CTP)
This performance construct represents the proficiency with which the soldier performs the tasks that are "central" to the MOS. The tasks represent the core of the job and they are the primary definers of the MOS. For example, the first-tour Armor Crewman starts and stops the tank engines; prepare the loader's station; loads and unloads the main gun; boresights the M60A3; engages targets with the main gun; and performs misfire procedures. This performance construct does not include the individual's willingness to perform the task or the degree to which the individual can coordinate efforts with others. It refers to how well the individual can execute the core technical tasks the job requires, given a willingness to do so.

2. General Soldiering Proficiency (GSP)
In addition to the core technical content specific to an MOS, individuals in every MOS also are responsible for being able to perform a variety of general soldiering tasks -- for example, determines grid coordinates on military maps; puts on, wears, and removes M17 series protective mask with hood; determines a magnetic azimuth using a compass; collects/reports information; and recognizes and identifies friendly and threat aircraft. Performance on this construct represents overall proficiency on these general soldiering tasks. Again, it refers to how well the individual can execute general soldiering tasks, given a willingness to do so.

3. Effort and Leadership (ELS)
This performance construct reflects the degree to which the individual exerts effort over the full range of job tasks, perseveres under adverse or dangerous conditions, and demonstrates leadership and support toward peers. That is, can the individual be counted on to carry out assigned tasks, even under adverse conditions, to exercise good judgment, and to be generally dependable and proficient? While appropriate knowledges and skills are necessary for successful performance, this construct is meant only to reflect the individual's willingness to do the job required and to be cooperative and supportive with other soldiers.

4. Maintaining Personal Discipline (MPD)
This performance construct reflects the degree to which the individual adheres to Army regulations and traditions, exercises personal self-control, demonstrates integrity in day-to-day behavior, and does not create disciplinary problems. People who rank high on this construct show a commitment to high standards of personal conduct.

5. Physical Fitness and Military Bearings (PFB)
This performance construct represents the degree to which the individual maintains an appropriate military appearance and bearing and stays in good physical condition.

Figure 6.1. Definitions of the job performance constructs.

complete post-imputation performance data (see Chapter 5) are included in the current analyses. The number of these soldiers within each MOS is as follows:

11B	Infantryman	896
13B	Cannon Crewman	801
19E	M60 Armor Crewman	241
19K	M1 Armor Crewman	7[illegible]
31C	Single Channel Radio Operator	4[illegible]
63B	Light-Wheel Vehicle Mechanic	721
71L	Administrative Specialist	622
88M	Motor Transport Operator	662
91A	Medical Specialist	801
95B	Military Police	451

Measures

The complete array of first-tour performance measures administered to the LVI sample was described in Chapter 5. This array is listed in Figure 6.2. There are two primary differences between the array of first-tour performance measures administered to the LVI sample and that administered to the CVI sample. First, unlike soldiers in the CVI sample, soldiers in the LV sample were not administered MOS-specific written tests of school knowledge during first-tour performance measurement (many were, however, administered those tests during End-of-Training testing; see Chapter 3). Second, only males in the LVI sample were rated with the Combat Performance Prediction scales. So as not to exclude females, scores from these scales were not included in the current analyses.

Chapter 4 described how each of the major sets of performance measures was reduced from a large number of item, task, or individual scale scores to a smaller set of factor or category scores. The results of this first level of aggregation have been referred to as the "basic" array of criterion scores, summarized in Table 6.1. These are the scores that are used in the analyses described below. For purposes of comparison, the complete array of basic first-tour scores identified for the CV sample is provided in Table 6.2.

Despite the reduced set of measures administered to the LV sample, there is a great deal of correspondence between the basic scores created for the two samples. In both samples, basic scores for the hands-on tests and written job knowledge tests were created using the CVBITS (Communications, Vehicle Maintenance, Basic Military Skills, Identification of Friendly/Enemy Aircraft and Vehicles, Technical Skills, and Safety/Survival) classification scheme, which was developed using a combination of expert judgment and exploratory factor analysis (this development is described in J.P. Campbell, 1987). Also, the three Army-wide behaviorally anchored rating scales (BARS) composite scores (Effort and Leadership, Maintaining Personal Discipline, and Physical Fitness and Military Bearing), the single Overall Effectiveness rating, and the four archival/administrative indices (Awards/Certificates, Physical Readiness, Articles 15, and Promotion Rate) are common across the CVI and LVI samples.

On the other hand, as described above, soldiers in the LVI sample did not receive basic scores based on the written tests of school knowledge, nor were basic scores computed using the Combat Performance Prediction scales.

Finally, the two basic scores (Core Responsibilities and Peripheral Responsibilities) derived from the MOS-specific BARS for the CVI sample were replaced with a single MOS-specific BARS composite for the LVI sample.

- Ten behaviorally anchored rating scales designed to measure factors of non-job-specific performance (e.g., providing peer leadership and support, maintaining equipment, self-discipline).
- Single scale rating of overall job performance.
- Single scale rating of NCO potential.
- A 40-item summated rating scale for the prediction of combat performance.
- Four performance indicators from administrative records, the first three obtained via self-report and the last from computerized records.
    - Total number of awards and letters of commendation.
    - Physical fitness qualification.
    - Number of disciplinary infractions.
    - Promotion rate (in deviation units).
- Job-sample (hands-on) test of MOS-specific task proficiency. Individual is tested on each of 15 major tasks in an MOS.
- Paper-and-pencil tests designed to measure task-specific job knowledge. Individual is scored on 150-200 multiple-choice items representing 30 major job tasks. Fifteen of the tasks were also measured hands-on.
- MOS-specific behaviorally anchored rating scales. From 6 to 12 BARS were developed for each MOS to represent the major factors that constituted job-specific technical and task proficiency.

Figure 6.2. First-tour performance measures administered to soldiers in Longitudinal Validation sample Batch A MOS.

Altogether, the LVI first-tour performance measures were reduced to 20 basic scores. However, because MOS differ in their task content, not all 20 variables were scored in each MOS, and there was some slight variation in the number of variables used in the subsequent analyses. (This was also the case for the CVI data, which are shown in Campbell, 1988.) Means, standard deviations, and intercorrelations among the variables for each of the 10 jobs are shown in Appendix F.

Table 6.1

LVI Sample: Twenty Basic Criterion Scores Obtained by Aggregating Individual Rating Scales, Job Sample Tasks, Knowledge Test Items, and Personnel File Items

1.	Overall Effectiveness rating
2.	Army-Wide BARS: Effort and leadership factor
3.	Army-Wide BARS: Personal discipline factor
4.	Army-Wide BARS: Physical fitness and military bearing factor
5.	MOS-Specific BARS: Job-specific factor
6.	Personnel File: Awards and certificates
7.	Personnel File: Physical readiness test score
8.	Personnel File: Articles 15/flag actions
9.	Personnel File: Promotion rate deviation score
10.	Hands-On Test: Core Technical (MOS-specific) score
11.	Hands-On Test: Communications score
12.	Hands-On Test: Vehicle operation and maintenance score
13.	Hands-On Test: Basic skills (general soldiering) score
14.	Hands-On Test: Safety and survival score
15.	Job Knowledge Test: Core Technical (MOS-specific) score
16.	Job Knowledge Test: Communications score
17.	Job Knowledge Test: Vehicle operation and maintenance score
18.	Job Knowledge Test: Basic skills (general soldiering) score
19.	Job Knowledge Test: Identifying target/threat vehicles and aircraft
20.	Job Knowledge Test: Safety and survival score

Table 6.2

CVI Sample: Twenty-Nine Basic Criterion Scores Obtained by Aggregating Individual Rating Scales, Job Sample Tasks, Knowledge Test Items, and Personnel File Items

1. Overall Effectiveness rating

2. Army-Wide BARS: Effort and leadership factor
3. Army-Wide BARS: Personal discipline factor
4. Army-Wide BARS: Physical fitness and military bearing factor

5. MOS-Specific BARS: Core responsibilities factor
6. MOS-Specific BARS: Peripheral responsibilities factor

7. Combat Rating scales: Performing well under adverse conditions factor
8. Combat Rating scales: Avoiding mistakes factor

9. Personnel File: Awards and certificates
10. Personnel File: Physical readiness test score
11. Personnel File: Articles 15/flag actions
12. Personnel File: Promotion rate deviation score

13. Hands-On Test: Core Technical (MOS-specific) score
14. Hands-On Test: Communications score
15. Hands-On Test: Vehicle operation and maintenance score
16. Hands-On Test: Basic skills (general soldiering) score
17. Hands-On Test: Safety and survival score

18. Job Knowledge Test: Core Technical (MOS-specific) score
19. Job Knowledge Test: Communications score
20. Job Knowledge Test: Vehicle operation and maintenance score
21. Job Knowledge Test: Basic skills (general soldiering) score
22. Job Knowledge Test: Identifying target/threat vehicles and aircraft

23. School Knowledge Test: Safety and survival score
24. School Knowledge Test: Core Technical (MOS-specific) score
25. School Knowledge Test: Communications score
26. School Knowledge Test: Vehicle operation and maintenance score
27. School Knowledge Test: Basic skills (general soldiering) score
28. School Knowledge Test: Identifying target/threat vehicles and aircraft
29. School Knowledge Test: Safety and survival score

Analyses

Confirmatory factor-analytic techniques were applied to each MOS individually, using LISREL VII (Jöreskog & Sörbom, 1989). Several specific models were evaluated. The general model considered here is defined by the following equation:

$$y = \Lambda_y \eta + \epsilon \quad ,$$

where y are the observed variable, Λ_y is the matrix of loadings of the observed variables on the unobserved variables (factors), η, and ϵ are the error terms or estimates of unique variance for each observed variable.

The covariances among the unobserved variables or factors are represented by the Φ matrix. The diagonal elements of the Φ matrix are fixed to one in this analysis, so that the Φ elements are actually the correlations among the unobserved variables. In all cases, the model specified that the correlation among the two method factors and those between the method factors and the performance factors should be zero. This specification "effectively defined the method factor as that portion of the common variance among measures from the same method that was not predictable from (i.e., correlated with) any of the other related factor or performance construct scores" (J.P. Campbell et al., 1990, p. 323).

Parameters estimated for each MOS were the loadings of the observed variables on the specified common factors, the unique variances or errors for each observed variable, and the correlations among the unobserved variables. The fit of the model was assessed for each MOS using the chi-square statistic and the root mean-square residual (RMSR). The chi-square statistic indicates whether the matrix of correlations among the variables reproduced using the model is different from the original correlation matrix. The RMSR, similarly, summarizes the differences between entries in the reproduced matrix and the original matrix (Bollen, 1989).

The first model fit to the LVI data was a five-factor model corresponding to that developed using CVI data. As in the CVI analyses (J.P. Campbell et al., 1990), out-of-range values were encountered in a number of MOS for the correlations among the factors, for the unique variances, and/or for the factor loadings. In the CVI analyses, this difficulty was resolved by setting, for each MOS, the estimates of unique variance equal to one minus the squared multiple correlation of the corresponding variable. When out-of range values persisted, the estimate of unique variance was reset to .05.

For the current LVI analyses, only the second step was taken; that is, for those variables for which the initial estimate of the uniqueness coefficient was negative, the estimates were set at .05, and the model was rerun. Thus, the uniqueness coefficient for the Physical Fitness and Military Bearing rating was set to .05 for each of the 10 MOS, as was the uniqueness coefficient for the Maintaining Personal Discipline rating for 11B, 19E, and 88M. These actions had the desired effect of making the uniqueness matrix for each MOS positive definite and bringing the factor correlations and factor loadings back into range.

Note that it was necessary to set the uniqueness estimates for the Physical Fitness and Military Bearing rating to .05 in both the CVI and LVI

analyses. This is perhaps due to an identification problem in the model, caused by the fact that the PFB performance factor is defined by only two variables, one of which (the Physical Readiness test score) is only marginally related to the other variables in the model.

After the fit of the five-factor model was assessed in each MOS, four reduced models (all nested within the five-factor model) were examined. These models are described below. As with the five-factor model, the fit of the reduced models was assessed using the chi-square statistic and the root mean-square residual. Also, to maintain the nested structure of the models, the uniqueness estimates that were set to .05 for the five-factor models were set to .05 for each of the reduced models.

Finally, as had been done in the original CVI analyses, the five-factor model was applied to the Batch A MOS simultaneously (using LISREL's multigroups option). This model constrained the following to be invariant across jobs: (a) the correlations among performance factors, (b) the loadings of all the Army-wide measures on the performance factors and on the rating method factor, (c) the loadings of the MOS-specific BARS scores on the rating method factor, and (d) the uniqueness coefficients of the Army-wide measures. As described above, the unique variance for the Physical Fitness and Military Bearing rating was fixed to .05 for all 10 MOS, as was the unique variance for the Maintaining Personal Discipline rating for 11B, 19E, and 88M.

Results

Confirmatory Factor Analyses Within MOS

Five-factor model. The resulting factor loading estimates, uniqueness estimates and factor intercorrelation estimates for the five-factor model, as fit to each Batch A job in the LV sample, are shown in Tables 6.3, 6.4, and 6.5. As previously described, this model consists of five performance factors (CTP, GSP, ELS, MPD, and PFB) and two method factors (Ratings and Written).

Note that all of the CVBITS variables (from the hands-on and job knowledge tests) for MOS 11B were specified to load on the General Soldiering Proficiency performance factor (thus resulting in only a four-factor model for this MOS). These specifications were made because the 11B job is the basic infantry position, consisting of tasks that soldiers in all MOS are expected to be able to perform. However, because these common tasks form the "technical" component of the infantry MOS, this factor was treated as the Core Technical Proficiency performance factor in CVI validation analyses (and is treated as such in the LVI validation analyses reported in Chapter 7).

For comparison purposes, the corresponding results for the five-factor model as applied to the CVI data are reported in Tables 6.6, 6.7, and 6.8. To make the comparison as interpretable as possible, we computed these results using exactly the same procedures described above for the LVI analyses. Thus, these results are different from those previously reported in J.P. Campbell et al. (1990) in that they include only those variables (i.e., basic scores) that were also available for the LVI analyses. Also, the uniqueness estimates were fixed to .05 for those variables whose initial estimates were out of range (i.e., negative); for all other variables, the uniqueness estimate was estimated using LISREL.

Table 6.3

Factor Loadings for LVI Five-Factor Performance Model: Separate Model for Each Job

Factor/Score[a]	11B	13B	19E	19K	31C	63B	71L	88M	91A	95B
	MOS									
Core Technical										
HO Technical Skill	-	.57	.49	52	.62	.60	.68	.29	.63	.43
JK Technical Skill	-	.59	.64	53	.63	.51	.68	.52	.55	.43
General Soldiering										
HO Basic Skill	.67	.71	.45	.58	.48	.38	.67	.72	.57	.51
HO Safety	.48	.31	.30	.43	.39	.41	.34	.48	.60	.37
HO Communication	.20	.24	.48	.38	.55	-	-	-	-	-
HO Vehicle	-	-	-	-	.38	.38	-	[b]	-	.34
JK Basic Skill	.69	.51	.62	.43	.45	.53	.71	.58	.66	.54
JK Safety	.53	.43	.49	.47	.39	.54	.45	.49	.60	.43
JK Communication	.25	.22	.63	.41	.52	-	-	-	-	.50
JK Vehicle	-	-	-	-	.30	.42	-	[b]	.34	.07
JK Identify	.30	.17	.43	.22	.17	-	-	.06	.24	.19
Effort/Leadership										
Effort/Lead Rating	.73	.68	.70	.59	.53	.62	.67	.61	.62	.50
MOS Rating	.73	.61	.62	.60	.41	.55	.51	.54	.53	.39
Awards/Certificate	.27	.36	.19	.28	.32	.24	.26	.24	.37	.27
Overall Rating	.63	.47	.47	.50	.16	.46	.61	.55	.46	.20
Discipline										
Discipline Rating	.51	.46	.51	.38	.46	.47	.49	.40	.47	.40
Articles 15	-54	-.60	-.67	-.55	-.57	-.51	-.45	-.50	-.52	-.56
Promotion Rate	.71	.67	.67	.80	.56	.65	.56	.78	.65	.63
Overall Rating	.11	.19	19	.11	.31	.16	.03	.07	.10	.31
Fitness/Bearing										
Fitness Rating	.86	.88	80	.81	.77	.80	.87	.83	.82	.73
Physical Readiness	.23	.26	28	.39	.38	.29	.39	.24	.46	.45
Ratings Method										
Effort/Lead Rating	.57	.60	.60	.70	.74	.66	.65	.69	.67	.77
Discipline Rating	.80	.67	.76	.80	.65	.74	.72	.86	.70	.69
Fitness Rating	.38	.37	.45	.49	.[illegible]4	.51	.41	.48	.49	.53
Overall Rating	.54	.59	61	.6[illegible]	.71	.62	.60	.66	.68	.77
MOS Rating	.51	.44	49	.60	.65	.64	.67	.61	.58	.71
Written Method										
JK Technical Skill	-	.49	.35	.56	.60	.62	.34	.64	.72	.68
JK Basic Skill	.54	.63	.57	.64	.49	.44	.30	.53	.34	.61
JK Safety	.58	.57	.[illegible]6	.52	.55	.40	.40	.57	.60	.61
JK Communication	.34	.13	.38	.33	.56	-	-	-	-	.52
JK Vehicle	-	-	-	-	.15	.55	-	[b]	.17	.19
JK Identify	.31	.27	.19	.34	.13	-	-	.11	.12	.16

Note. Dashes indicate the variable was not scored in that MOS.

[a] HO=Hands-On; JK=Job Knowledge Test; MOS=Job-Specific Ratings.
[b] Vehicle content was merged into the Core Technical factor for MOS 88M.

Table 6.4

Uniqueness Estimates for LVI Five-Factor Performance Model: Separate Model for Each Job

Score[a]	MOS									
	11B	13B	19E	19K	31C	63B	71L	88M	91A	95B
HO Technical Skill	-	.59	.61	.68	.46	.53	.45	.85	.53	.72
HO Basic Skill	.50	.47	.71	.59	.62	.78	.52	.44	.59	.66
HO Safety	.71	.85	.72	.76	.73	.77	.80	.70	.59	.76
HO Communication	.92	.90	.68	.75	.64	-	-	-	-	-
HO Vehicle	-	-	-	-	.73	.76	-	[b]	-	.80
JK Technical Skill	-	.31	.36	.35	.11	.28	.38	.28	.11	.30
JK Basic Skill	.18	.25	.23	.33	.35	.48	.38	.31	.37	.28
JK Safety	.35	.40	.34	.45	.40	.48	.60	.35	.24	.38
JK Communication	.79	.88	.38	.61	.34	-	-	-	-	.42
JK Vehicle	-	-	-	-	.73	.45	-	[b]	.77	.86
JK Identify	.76	.87	.65	.78	.86	-	-	.93	.90	.86
Effort/Lead Rating	.08	.10	.08	.09	.07	.08	.10	.09	.08	.07
Discipline Rating	.05	.23	.05	.16	.23	.15	.22	.05	.19	.30
Fitness Rating	.05	.05	.05	.05	.05	.05	.05	.05	.05	.05
Overall Rating	.15	.19	.16	.16	.19	.21	.21	.17	.18	.09
MOS Rating	.16	.33	.24	.22	.27	.19	.26	.25	.28	.22
Awards/Certificate	.89	.81	.84	.87	.78	.84	.84	.75	.78	.81
Articles 15	.63	.58	.36	.65	.60	.66	.76	.64	.63	.59
Physical Readiness	.84	.85	.79	.79	.78	.87	.77	.85	.72	.71
Promotion Rate	.45	.45	.42	.30	.63	.53	.65	.35	.53	.56

Note. Dashes indicate the variable was not scored in that MOS.

[a] HO=Hands-On; JK=Job Knowledge Test; MOS=Job-Specific Ratings.
[b] Vehicle content was merged into the Core Technical factor for MOS 88M.

Table 6.5

Factor Intercorrelations for LVI Five-Factor Performance Model: Separate Model for Each Job

First Factor	Second Factor	MOS 11B	13B	19E	19K	31C	63B	71L	88M	91A	95B
Core Technical	General Soldier	[a]	.84	.84	.81	.83	.80	.75	.86	.87	.78
	Effort/Lead	[a]	.51	.32	.40	.44	.50	.45	.35	.51	.42
	Discipline	[a]	.38	.26	.15	.28	.21	.36	.28	.44	.22
	Fitness	[a]	.14	.06	.07	.04	.00	.17	.-05	.17	.02
General Soldiering	Effort/Lead	.53	.36	.48	.26	.52	.41	.26	.41	.53	.39
	Discipline	.40	.29	.41	.03	.30	.19	.23	.23	.41	.21
	Fitness	.16	-.02	.09	.00	.08	-01	.10	.09	.19	.12
Effort/ Leadership	Discipline	.63	.67	.62	.58	.59	.57	.68	.61	.77	.79
	Fitness	.73	.62	.58	.65	.39	.49	.62	.60	.59	.51
Discipline	Fitness	.55	.58	.52	.44	.41	.50	.47	.48	.43	.67

[a] No Core Technical Proficiency factor for MOS 11B.

The fit of the five-factor model for each MOS in the LVI and CVI samples is reported in Table 6.9. Note that the root mean-square residuals for the LVI data are very similar to those for the CVI data. In fact, for three of the MOS (11B, 13B, and 71L), the RMSRs for the LVI data are smaller than those for the CVI data. These results indicate that the model developed using the CVI data does fit the LVI data quite well.

Reduced models. As previously indicated, four reduced models were also examined using the LVI data. The reason for examining these models was to determine how much fit would be lost by trying to achieve a more parsimonious model (i.e., a model with fewer performance factors). Each of the reduced models retained the two method factors and the specification that these method factors be uncorrelated with each other and with the performance factors.

For the **four-factor model**, the Core Technical Proficiency and General Soldiering Proficiency performance factors were collapsed into a single "can do" performance factor. Specifications for the Effort and Leadership, Maintaining Personal Discipline, and Physical Fitness and Military Bearing performance factors were not altered. The **three-factor model** retained the "can do" performance factor of the four-factor model, but also collapsed the Effort and Leadership and Maintaining Personal Discipline performance factors into a "will do" performance factor. Once again, specifications for the Physical Fitness and Military Bearing performance factor were not changed. For the **two-factor model**, the "can do" performance factor was retained; however, the Physical Fitness and Military Bearing performance factor became part of the "will do" performance factor. Finally, for the **one-factor model**, the "can do" and "will do" performance factors (or, equivalently, the five original performance factors) were collapsed into a single performance factor.

The chi-square statistics and RMSRs, respectively, for the four reduced models, as well as for the five-factor model, are provided in Tables 6.10 and 6.11. An examination of the results in these tables indicate that the four- and five-factor models fit the LVI data well, while the one-, two-, and three-factor models fit the data much less well.

Whereas the average increase in chi-square was approximately 17.7 (for 4 degrees of freedom) between the five- and four-factor models, it was 51.5 (4 degrees of freedom) between the four- and three-factor models, 104.5 (2 degrees of freedom) between the three- and two-factor models, and 94.7 (1 degree of freedom) between the two- and one-factor models. The RMSRs also increased greatly after four factors. The average increase from the five-factor model to the four-factor model was .002, from the four- to the three- was .015, from the three- to the two- was .027, and from the two- to the one- was .042.

These results suggest that a model composed of only four performance factors (combining the CTP and GSP performance factors) and the two method factors fit the LVI data almost as well as the original model. However, further reductions in the model result in very poor fits to the data.

Table 6.6

Factor Loadings for CVI Five-Factor Performance Model: Separate Model for Each Job

Factor/Score[a]	11B	13B	19E	31C	63B	64C	71L	91A	95B
	MOS								
Core Technical									
HO Technical Skill	-	.59	.54	.54	.54	.26	.71	.57	.36
JK Technical Skill	-	.54	.66	.74	.63	.47	.65	.65	.40
General Soldiering									
HO Basic Skill	.59	.72	.49	.42	.28	.70	.70	.42	.53
HO Safety	.29	.25	.37	.29	.20	.42	.54	.54	.38
HO Communication	.06	.19	.50	.60	-	-	-	-	-
HO Vehicle	-	-	-	.17	.16	[b]	-	-	.26
JK Basic Skill	.67	.41	.59	.45	.53	.57	.62	.66	.55
JK Safety	.47	.23	.56	.43	.56	.46	.47	.61	.47
JK Communication	.32	.08	.49	.53	-	-	-	-	.37
JK Vehicle	-	-	-	.38	51	[b]	-	.08	.24
JK Identify	.48	.20	.33	.30	-	.08	-	.31	.16
Effort/Leadership									
Effort/Lead Rating	.74	.56	.71	.66	.58	.63	.64	.69	.56
MOS Rating	.72	.38	.57	.45	.51	.47	.55	.63	.57
Awards/Certificate	.22	.24	.25	.14	.20	.26	.17	.40	.33
Overall Rating	.65	.32	.24	.12	.20	.20	.56	.40	.61
Discipline									
Discipline Rating	.54	.45	.58	.50	.50	.55	.39	.52	.45
Articles 15	-.67	-.58	-.59	-.54	-.56	-.49	-.70	-.49	-.59
Promotion Rate	.65	.55	.65	.53	.63	.60	.53	.54	.54
Overall Rating	.11	.26	.41	.49	.34	.37	.04	.23	.04
Fitness/Bearing									
Fitness Rating	.88	.79	.83	.83	.82	.77	.87	.81	.84
Physical Readiness	.23	.25	.41	.37	.37	.32	.32	.45	.49
Ratings Method									
Effort/Lead Rating	.53	.71	.59	.63	.73	.69	.63	.65	.73
Discipline Rating	.75	.61	.50	.59	.62	.61	.81	.65	.72
Fitness Rating	.34	.54	.44	.43	.49	.54	.39	.52	.43
Overall Rating	.51	.68	.67	.67	.75	.70	.61	.69	.67
MOS Rating	.43	.62	.52	.65	.67	.63	.53	.49	.62
Written Method									
JK Basic Skill	.65	.62	.59	.47	.43	.64	.39	.24	.63
JK Safety	.53	.69	.50	.61	.23	.59	.43	.59	.49
JK Communication	.32	.16	.32	.46	-	-	-	-	.44
JK Vehicle	-	-	-	.14	.50	[b]	-	.16	.22
JK Identify	.11	.26	.15	.09	-	.12	-	.04	.21

Note. Dashes indicate the variable was not scored in that MOS.

[a] HO=Hands-On; JK=Job Knowledge Test; MOS=Job-Specific Ratings.
[b] Vehicle content was merged into the Core Technical factor for MOS 64C.

Table 6.7

Uniqueness Estimates for CVI Five-Factor Performance Model: Separate Model for Each Job

	MOS								
Score[a]	11B	13B	19E	31C	63B	64C	71L	91A	95B
HO Technical Skill	-	.52	.65	.60	.67	.88	.42	.64	.83
HO Basic Skill	.61	.43	.70	.70	.88	.50	.50	.75	.65
HO Safety	.87	.87	.81	.77	.91	.77	.67	.65	.79
HO Communication	.96	.92	.67	.58	-	-	-	-	-
HO Vehicle	-	-	-	.88	.92	b	-	-	.83
JK Technical Skill	-	.31	.36	.15	.05	.49	.23	.08	.36
JK Basic Skill	.05	.35	.26	.45	.47	.22	.41	.45	.24
JK Safety	.45	.40	.39	.39	.55	.39	.51	.26	.49
JK Communication	.76	.90	.59	.43	-	-	-	-	.62
JK Vehicle	-	-	-	.72	.46	b	-	.82	.83
JK Identify	72	.87	.83	.80	-	.95	-	.82	.84
Effort/Lead Rating	.07	.07	.10	.08	.07	.05	.12	.08	.11
Discipline Rating	.05	.30	.34	.34	.30	.25	.09	.25	.22
Fitness Rating	.05	.05	.05	.05	.05	.05	.05	.05	.05
Overall Rating	.12	.16	.13	.12	.13	.14	.21	.14	.11
MOS Rating	.18	.35	.36	.24	.21	.31	.33	.34	.24
Awards/Certificate	.83	.82	.83	.81	.90	.81	.88	.67	.75
Articles 15	.44	.56	.60	.63	.66	.69	.49	.69	.61
Physical Readiness	.85	.87	.77	.70	.79	.84	.79	.72	.72
Promotion Rate	.47	.66	.53	.65	.57	.60	.69	.64	.64

Note. Dashes indicate the variable was not scored in that MOS.

[a] HO=Hands-On; JK=Job Knowledge; SK=School Knowledge.
[b] Vehicle content was merged into the Technical factor for MOS 64C.

Table 6.8

Factor Intercorrelations for CVI Five-Factor Performance Model: Separate Model for Each Job

		MOS								
First Factor	Second Factor	11B	13B	19E	31C	63B	64C	71L	91A	95B
Core Technical	General Soldier	[a]	.84	.89	.84	.81	.81	.50	.87	.72
	Effort/Lead	[a]	.62	.50	.57	.48	.48	.28	.41	.41
	Discipline	[a]	.27	.33	.37	.22	.36	.20	.43	.28
	Fitness	[a]	.10	.06	.08	-.02	.06	-.05	-.01	11
General Soldiering	Effort/Lead	.52	51	.63	.50	.51	.42	.20	.40	.38
	Discipline	.46	.27	.43	.34	.21	.23	.08	.34	.27
	Fitness	.15	.06	.09	.10	.05	.06	-.03	.03	.17
Effort/ Leadership	Discipline	.64	.82	.82	.74	.77	.80	.53	.79	.59
	Fitness	.70	.52	.44	.44	.32	.35	.53	.43	.71
Discipline	Fitness	.45	.58	.43	.59	.53	.45	.44	.40	.45

[a] No Core Technical Proficiency factor for MOS 11B.

Table 6.9

Comparison of Fit Statistics for CVI and LVI Five-Factor Solutions: Separate Model for Each Job

	CVI				LVI			
MOS	n	RMSR	Chi-square	df	n	RMSR	Chi-square	df
11B[a]	687	.063	198.1	88	896	.044	213.8	88
13B	654	.066	218.9	114	801	.059	244.1	114
19E	489	.043	143.0	114	241	.072	148.9	114
19K[b]					780	.049	236.8	114
31C	349	.060	205.5	148	483	.077	290.4	148
63B	603	.047	129.8	99	721	.065	219.6	99
64C/88M[c]	667	.053	140.0	84	662	.057	221.4	84
71L	495	.067	99.8	71	622	.045	108.3	71
91A	491	.050	162.2	98	801	.056	245.6	98
95B	686	.046	236.7	130	451	.061	199.4	130

[a] Fit statistics for MOS 11B are for four-factor model (all factors except Core Technical Proficiency).
[b] MOS 19K not included in Concurrent Validation sample.
[c] MOS 64C in Concurrent Validation sample is designated as MOS 88M in Longitudinal Validation sample.

Table 6.10

LVI Chi-Squares for Five-, Four-, Three-, Two-, and One-Factor Performance Models

	Five Factors		Four Factors		Three Factors		Two Factors		One Factor	
MOS	Chi-square	df	Chi-square	df	Chi-square	df	Chi-square	df	Chi-square	df
11B[a]	213.8	88	213.8	88	327.8	92	553.6	94	676.6	95
13B	244.1	114	268.4	118	314.4	122	430.1	124	522.6	125
19E	148.9	114	154.6	118	194.8	122	245.8	124	282.1	125
19K	236.8	114	255.6	118	315.1	122	432.5	124	546.1	125
31C	290.4	148	307.6	152	339.4	156	413.0	158	497.7	159
63B	219.6	99	236.7	103	290.3	107	359.8	109	441.6	110
71L	108.3	71	143.9	75	167.2	79	227.8	81	360.6	82
88M	221.4	84	235.0	88	318.2	92	466.7	94	571.5	95
91A	245.6	98	263.8	102	296.9	106	439.2	108	578.6	109
95B	199.4	130	208.2	134	228.2	138	269.2	140	307.3	141

[a] Five- and four-factor models are the same for MOS 11B.

Table 6.11

LVI Root Mean-Square Residuals for Five-, Four-, Three-, Two-, and One-Factor Performance Models

	Five Factors	Four Factors	Three Factors	Two Factors	One Factor
MOS	RMSR	RMSR	RMSR	RMSR	RMSR
11B[a]	.044	.044	.064	.092	.134
13B	.059	.063	.071	.070	.114
19E	.072	.072	.098	.141	.212
19K	.049	.049	.069	.091	.134
31C	.077	.084	.119	.147	.163
63B	.065	.066	.074	.079	.104
71L	.045	.053	.054	.078	.150
88M	.057	.057	.072	.100	.150
91A	.056	.056	.058	.122	.159
95B	.061	.060	.071	.095	.123

[a] Five- and four-factor models are the same for MOS 11B.

Confirmatory Factor Analyses Across MOS

The results reported in Tables 6.3, 6.4, and 6.5 indicate that the parameter estimates for the five-factor model were generally similar across the 10 MOS. The final step was to determine whether the variation in some of these parameters could be attributed to sampling variation. To do this (as described earlier), we examined the fit of a model in which the following were invariant across jobs: (a) the correlations among performance factors, (b) the loadings of all the Army-wide measures on the performance factors and on the rating method factor, (c) the loadings of the MOS-specific BARS score on the rating method factor, and (d) the uniqueness coefficients for the Army-wide measures.

J.P. Campbell et al. (1990) indicate that this is a relatively stringent test of a common latent structure across jobs. They state that it is "quite possible that selectivity differences in different jobs would lead to differences in the apparent measurement precision of the common instruments or to differences in the correlations between the constructs. This would tend

to make it appear that the different jobs required different performance models, when in fact they do not." (p. 324)

The LISREL multigroups option requires that the number of observed variables be the same for each job. However, as was the case for the CV data, for virtually every MOS at least one of the CVBITS variables was missing for the LVI job knowledge or hands-on tests. To handle this problem, the uniqueness coefficients for these variables were set at 1.00 and the observed correlations between these variables and all the other variables were set to zero. It was thus necessary to adjust the degrees of freedom for the chi-square statistic by subtracting the number of "observed" correlations that we generated in this manner. (It was likewise necessary to adjust the root mean-square residuals for this analysis.)

The factor loadings estimates, uniqueness estimates, and factor intercorrelation estimates for the single model across MOS appear in Tables 6.12, 6.13, and 6.14, respectively. The chi-square statistic for this model, based on 1,332 degrees of freedom, was 2,714.27. This result can be compared to the sum of the chi-square values (2,128.24) and degrees of freedom (1,060) reported in Table 6.9 for the LVI within-job analyses. More specifically, the difference between the chi-square associated with the single five-factor model across MOS and the sum of the chi-squares associated with the 10 separately fit models (i.e., 2,714.27 - 2,128.24 = 586.03) is itself distributed according to chi-square, with degrees of freedom equal to the difference between the degrees of freedom associated with the former and the sum of the degrees of freedom associated with the latter (i.e., 1,332 - 1,060 = 272).

These results indicate that the fit of the five-factor model is significantly worse when the parameters listed above are constrained to be equal across the 10 jobs. Still, the root mean-square residuals associated with the across-MOS model, reported in Table 6.15, are not substantially greater than those for the within-job analyses reported in Table 6.9. (The average RMSR for the across-MOS model is .0676; the average for the within-MOS models is .0585.)

CREATING CRITERION CONSTRUCT SCORES FOR VALIDATION ANALYSES

The analyses reported above demonstrate the usefulness of the five-factor, first-tour performance model in expressing relations among job performance scores for the LVI data. These analyses also reveal that a four-factor model, in which the Core Technical Proficiency and General Soldiering Proficiency factors are combined, fits the LVI data almost as well as the five-factor model; however, condensation beyond the four-factor model yields models that fit the LVI data poorly.

Performance Factor Scores

To create criterion construct scores for use in validation analyses, we chose to base our scoring procedures on the five-factor model. Although the four-factor model has the advantage of greater parsimony than the five-factor model, the five-factor model offers the advantage of corresponding to the criterion constructs generated in the CVI validation analyses. Table 6.16 shows the mapping of the basic scores on the five performance factors. These scores were combined as described below.

Table 6.12

Factor Loadings for LVI Five-Factor Performance Model: Single Model Across All Jobs

	MOS									
Factor/Score[a]	11B	13B	19E	19K	31C	63B	71L	88M	91A	95B
Core Technical										
HO Technical Skill	-	.55	.50	.51	.61	.56	.67	.31	.60	.41
JK Technical Skill	-	.59	.56	.57	.62	.51	.70	.52	.56	.48
General Soldiering										
HO Basic Skill	.64	.70	.47	.53	.49	.39	.63	.72	.53	.55
HO Safety	.47	.30	.31	.39	.40	.41	.32	.47	.57	.34
HO Communication	.17	.23	.43	.42	.52	-	-	-	-	-
HO Vehicle	-	-	-	-	.39	.34	-	b	-	.28
JK Basic Skill	.68	.50	.64	.45	.47	.52	.69	.57	.65	.52
JK Safety	.54	.41	.52	.51	.39	.55	.44	.48	.50	.44
JK Communication	.24	.19	.52	.41	.50	-	-	-	-	.41
JK Vehicle	-	-	-	-	.31	.40	-	b	.37	.14
JK Identify	.28	.15	.51	.24	.15	-	-	.06	.24	.27
Effort/Leadership										
Effort/Lead Rating[c]	65	.65	.65	.65	.65	.65	.65	.65	.65	.65
MOS Rating	.66	.55	.63	.65	.60	.59	.53	.57	.59	.57
Awards/Cert[c]	.26	.26	.26	.26	.26	.26	.26	.26	.26	.26
Overall Rating[c]	.56	.56	.56	.56	.56	.56	.56	.56	.56	.56
Discipline										
Discipline Rating[c]	.44	.44	.44	.44	.44	.44	.44	.44	.44	.44
Articles 15[c]	-.54	-.54	-.54	-.54	-.54	-.54	-.54	-.54	-.54	-.54
Promotion Rate[c]	.67	.67	.67	.67	.67	.67	.67	.67	.67	.67
Overall Rating[c]	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10
Fitness/Bearing										
Fitness Rating[c]	.82	.82	.82	.82	.82	.82	.82	.82	.82	.82
Phys Readiness[c]	.33	.33	.33	.33	.33	.33	.33	.33	.33	.33
Ratings Method										
Eff/Ldr Rating[c]	.61	.61	.61	.61	.61	.61	.61	.61	.61	.61
Discipline Rating[c]	.79	.79	.79	.79	.79	.79	.79	.79	.79	.79
Fitness Rating[c]	.42	.42	.42	.42	.42	.42	.42	.42	.42	.42
Overall Rating[c]	.59	.59	.59	.59	.59	.59	.59	.59	.59	.59
MOS Rating[c]	.54	.54	.54	.54	.54	.54	.54	.54	.54	.54
Written Method										
JK Tech Skill	-	.48	.44	.54	.61	.60	.29	.65	.74	.63
JK Basic Skill	.51	.63	.50	.64	.49	.45	.30	.54	.33	.64
JK Safety	.56	.57	.48	.51	.54	.40	.43	.58	.58	.60
JK Communication	.33	.14	.47	.33	.56	-	-	-	-	.57
JK Vehicle	-	-	-	-	.15	.56	-	b	.16	.15
JK Identify	30	.27	.06	.34	.14	-	-	.12	.11	.13

Note. Dashes indicate the variable was not scored in that MOS.

[a] HO=Hands-On; JK=Job Knowledge Test; MOS=Job-Specific Ratings.
[b] Vehicle content was merged into the Core Technical factor for MOS 88M.
[c] Factor loadings constrained to be equal across all MOS for these factors/measures.

Table 6.13

Uniqueness Estimates for LVI Five-Factor Performance Model: Single Model Across All Jobs

Score[a]	11B	13B	19E	19K	31C	63B	71L	88M	91A	95B
	MOS									
HO Technical Skill	-	.59	.60	.69	.46	.54	.47	.85	.53	.74
HO Basic Skill	.50	.46	.69	.62	.62	.77	.54	.44	.60	.65
HO Safety	.70	.85	.72	.77	.73	.77	.81	.69	.59	.77
HO Communication	.92	.90	.68	.75	.65	-	-	-	-	-
HO Vehicle	-	-	-	-	.73	.77	-	b	-	.80
JK Technical Skill	-	30	.36	.35	.11	.29	.41	.26	.07	.31
JK Basic Skill	.18	.25	.25	.33	.35	.48	.40	.32	.36	.28
JK Safety	.35	.40	.35	.45	.40	.48	.58	.34	.25	.38
JK Communication	.79	.88	.37	.61	.35	-	-	-	-	.42
JK Vehicle	-	-	-	-	.72	.45	-	b	.77	.86
JK Identify	.76	.87	.61	.78	.86	-	-	.93	.90	.86
Effort/Lead Rating[c]	.09	.09	.09	.09	.09	.09	.09	.09	.09	.09
Discipline Rating[c]	.05	.09	.05	.09	.09	.09	.09	.05	.09	.09
Fitness Rating[c]	.05	.05	.05	.05	.05	.05	.05	.05	.05	.05
Overall Rating[c]	.16	.16	.16	.16	.16	.16	.16	.16	.16	.16
MOS Rating	.16	.34	.23	.22	.26	.19	.27	.25	.28	.21
Awards/Certificate[c]	.83	.83	.83	.83	.83	.83	.83	.83	.83	.83
Articles 15[c]	.61	.61	.61	.61	.61	.61	.61	.61	.61	.61
Physical Readiness[c]	.80	.80	.80	.80	.80	.80	.80	.80	.80	.80
Promotion Rate[c]	.47	.47	.47	.47	.47	.47	.47	.47	.47	.47

Note: Dashes indicate the variable was not scored in that MOS.

[a] HO=Hands-On; JK=Job Knowledge Test; MOS=Job-Specific Ratings.
[b] Vehicle content was merged into the Core Technical factor for MOS 88M.
[c] Uniqueness coefficients constrained to be equal across all MOS for these measures.

Table 6.14

Factor Intercorrelations for LVI Five-Factor Performance Model: Single Model for All Jobs

First Factor	Second Factor	11B	13B	19E	19K	31C	63B	71L	88M	91A	95B
		MOS									
Core Technical	General Soldier	[a]	.84	.84	.84	.84	.84	.84	.84	.84	.84
	Effort/Lead	[a]	.43	.43	.43	.43	.43	.43	.43	.43	.43
	Discipline	[a]	.31	.31	.31	.31	.31	.31	.31	.31	.31
	Fitness	[a]	.10	.10	.10	.10	.10	.10	.10	.10	.10
General Soldiering	Effort/Lead	.41	.41	.41	.41	.41	.41	.41	.41	.41	.41
	Discipline	.28	.28	.28	.28	.28	.28	.28	.28	.28	.28
	Fitness	.09	.09	.09	.09	.09	.09	.09	.09	.09	.09
Effort/ Leadership	Discipline	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60
	Fitness	.64	.64	.64	.64	.64	.64	.64	.64	.64	.64
Discipline	Fitness	.48	.48	.48	.48	.48	.48	.48	.48	.48	.48

Note. Correlations constrained to be equal across all MOS.

[a] No Core Technical Proficiency factor for MOS 11B.

Table 6.15

Root Mean-Square Residuals for LVI Five-Factor Performance Model: Same Model for Each Job

	Root Mean-Square Residual	
MOS	Same Model for Each Job	Separate Model for Each Job[a]
11B[b]	.073	.044
13B	.068	.059
19E	.080	.072
19K	.054	.049
31C	.073	.077
63B	.071	.065
71L	.062	.045
88M	.063	.057
91A	.069	.056
95B	.063	.061

[a] See Table 6.9.
[b] Root mean-square residual for MOS 11B is for four-factor model (all factors except Core Technical Proficiency).

Table 6.16

Mapping of Performance Measures Onto Latent Performance Factors

	Performance Factors					Method Factors	
Criterion Score*	Core Technical Proficiency	General Soldiering Proficiency	Effort and Leadership	Maintaining Personal Discipline	Physical Fitness/ Military Bearing	Written Know-ledge Tests	Rating Scales
AWB Effort/Lead Rating			X				X
AWB Discipline Rating				X			X
AWB Fitness Rating					X		X
AWB Overall Rating			X	X			X
MOS Rating			X			X	
Adm Awards/Certificate			X				
Adm Physical Readiness					X		
Adm Articles 15				X			
Adm Promotion Rate				X			
HO Technical	X						
HO Communication		X					
HO Vehicles		X					
HO General Soldier		X					
HO Safety/Survival		X					
JK Technical	X					X	
JK Communication		X				X	
JK Vehicles		X				X	
JK General Soldier		X				X	
JK IO Threat/Target		X				X	
JK Safety/Survival		X				X	

* AWS=Army-wide; HO=Hands-On; JK=Job Knowledge

The Core Technical Proficiency construct is composed of two components--the MOS-specific technical score from the hands-on tests and the MOS-specific technical score from the job knowledge tests. For this and all other constructs, the components were unit weighted; that is, they were combined by first standardizing them within MOS and then adding them together.

The General Soldiering Proficiency construct is also composed of two major components. The first component is operationally defined as the sum of each of the CVBITS scores (except the technical score, which is a component of the Core Technical Proficiency construct) from the Hands-On test. The second component is defined as the sum of the CVBITS scores (again, excluding the technical score) from the Job Knowledge test.

The Effort and Leadership criterion construct is composed of three components, the first of which corresponds to the single rating for Overall Effectiveness. The second component is composed of two subcomponents, both of which are also standardized within MOS. The first is one of the three factor scores derived from the Army-wide BARS scales (i.e., the Army-wide Effort and Leadership factor) and consists of the unit-weighted sum of five different scales (Technical Skill; Effort; Leadership; Maintain Equipment; Self-Development). The second subcomponent is the average of the MOS-specific BARS rating scales. The third and final component is the administrative measure identified as Total Awards/Letters.

The Maintaining Personal Discipline construct is composed of two major components. The first component is the Maintaining Personal Discipline score derived from the Army-wide BARS and consists of the unit-weighted sum of three different scales (Following Regulations; Integrity; Self-Control). The second component is the sum of two standardized administrative measures, Article 15/Flag Actions and the Promotion Rate Deviation score.

The fifth criterion construct, Physical Fitness and Military Bearing, is also composed of two major components. The first component is the Physical Fitness and Military Bearing score derived from the Army-wide BARS and consists of the unit-weighted sum of two different scales (Military Appearance; Physical Fitness). The second component corresponds to the administrative measure identified as the Physical Readiness score.

Criterion Residual Scores

As for the CVI data, five residual scores, corresponding to the five criterion constructs, were also created. This was done following the procedures developed in CVI. First, a paper-and-pencil "methods" factor was created by partialing from the total score on the Job Knowledge test that variance shared with all of the non-paper-and-pencil criterion measures (i.e., hands-on scores, rating scores, and administrative records). This residual was defined as the paper-and-pencil method score. Next, this paper-and-pencil method score was partialed from each of the Job Knowledge test scores used to create the Core Technical Proficiency and General Soldiering Proficiency constructs (as described above). The resulting "residualized" Job Knowledge test scores were then added to the hands-on scores (which were not residualized) to form residual Core Technical Proficiency and General Soldiering Proficiency scores.

A similar procedure was used to create residual criterion scores for the Effort and Leadership, Maintaining Personal Discipline, and Physical Fitness and Military Bearing constructs. First, a "total" rating score was computed by standardizing and summing the overall effectiveness rating score, the three Army-wide BARS factor scores, and the average MOS-specific BARS score. Next, a rating "method" score was created by partialing from the total rating score that variance associated with all of the non-rating criterion measures. The resulting method score was then partialed from the rating components of the Effort and Leadership, Maintaining Personal Discipline, and Physical Fitness and Military Bearing constructs. Finally, these residualized rating scores were then combined with the appropriate administrative measures (which were not residualized in any way) to form residual scores for the last three criterion constructs.

Criterion Intercorrelations

The five "raw" criterion construct scores, the five residual criterion construct scores, the total rating and job knowledge scores (described above), and the total score derived from the hands-on test were used to generate a 13 x 13 matrix of criterion intercorrelations for each MOS in Batch A. The averages of these correlations are reported in Table 6.17. These results are very similar to the correlations that were reported by J.P. Campbell et al. (1990) for the CVI sample, which are reproduced in Table 6.18, although the correlations reported for the CVI results did not include the job knowledge total score. Note that the similarity in correlations occurs despite the fact that the CVI results are based on criterion construct scores that were created using the full array of basic scores available for that sample, and not just those scores used to create the construct scores for the LVI sample.

CONCLUDING COMMENTS

These results indicate that the five-factor model of first-tour job performance developed using data from the Project A Concurrent Validation sample fit the first-tour Longitudinal Validation data to approximately the same degree. This conclusion holds for the relationships among the latent performance factors (as indicated by the results of the LISREL analyses) as well as for the correlations among the observed criterion construct scores.

The results also indicate that a four-factor model (in which the Core Technical Proficiency and General Soldiering Proficiency factors were combined into a single "can do" factor) fit the LVI data almost as well as the five-factor model. Whether this was also true for the CVI data was not examined; however, the average observed correlations between Core Technical and General Soldiering were very similar across the two samples (r=.57 for LV versus r=.53 for CV). Therefore, we believe that the four-factor model may have also fit reasonably well as a CVI sample.

Despite the relatively large relationship between CTP and GSP, validation results reported for the CVI sample did indicate that different equations were needed to predict the two performance constructs (Wise, McHenry, & Campbell, 1990). Furthermore, those results also indicated that the hypothesis of equal prediction equations across jobs could be rejected for the CTP construct but not for GSP. Based on these previous results and the results reported in this chapter, it seems justifiable to use the criterion

Table 6.17

Mean Intercorrelations Among 13 Summary Criterion Scores for the Batch A MOS in the LVI Sample

Summary Criterion Score	CTP Raw	GSP Raw	ELS Raw	MPD Raw	PFB Raw	CTP Res	GSP Res	ELS Res	MPD Res	PFB Res	PRT	HOT	JKT
CTP (raw)	1.00												
GSP (raw)	.57	1.00											
ELS (raw)	.25	.26	1.00										
MPD (raw)	.16	.18	.58	1.00									
PFB (raw)	.06	.06	[illegible]	.36	1.00								
CTP (residual)	.88	.41	.30	.20	.07	1.00							
GSP (residual)	.40	.88	.32	.23	.06	.45	1.00						
ELS (residual)	.41	.42	.70	.43	.26	.40	.42	1.00					
MPD (residual)	.20	.22	.28	.88	.17	.20	.23	.46	1.00				
PFB (residual)	.07	.07	.20	.21	.90	.04	.03	.29	.21	1.00			
Perf. Rating Total	.22	.24	.68	.72	.58	.27	.28	.40	.35	.24	1.00		
Hands-On Total	.72	.76	.26	.15	.08	.81	.85	.41	.18	.09	.23	1.00	
Job Knowledge Total	.74	.80	.25	.19	.04	.40	.46	.40	.23	.04	.22	.47	1.00

Table 6.18

Mean Intercorrelations Among 12 Summary Criterion Scores for the Batch A MOS in the CVI Sample

Summary Criterion Score	CTP Raw	GSP Raw	ELS Raw	MPD Raw	PFB Raw	CTP Res	GSP Res	ELS Res	MPD Res	PFB Res	PRT	HOT
CTP (raw)	1.00											
GSP (raw)	.53	1.00										
ELS (raw)	.28	.27	1.00									
MPD (raw)	.19	.16	.53	1.00								
PFB (raw)	.03	.04	.46	.33	1.00							
CTP (residual)	.88	.39	.35	.26	.03	1.00						
GSP (residual)	.38	.89	.33	.23	.04	.44	1.00					
ELS (residual)	.47	.45	.65	.44	.25	.45	.43	1.00				
MPD (residual)	.23	.19	.28	.89	.17	.25	.21	.48	1.00			
PFB (residual)	.04	.05	.19	.19	.92	-.01	.01	.28	.20	1.00		
Perf. Rating Total	.24	.21	.87	.65	.47	.31	.26	.44	.33	.19	1.00	
Hands-On Total	.74	.72	.26	.15	.07	.82	.79	.44	.18	.09	.20	1.00

construct scores associated with all five factors in the Longitudinal Validation analyses reported in Chapter 7.

These results are both remarkable and promising from the point of view of theory development in job performance. A multidimensional model of job performance has been strongly confirmed in a new, large sample. Measures of job performance using hands-on tests, written tests, ratings, and administrative measures were administered to nine different jobs in two large cohorts; the performance model was developed in one cohort and confirmed in the second. Chapter 7 examines the nat of the relationships of the confirmed model of job performance in the secol cohort with the same set of predictor measures used in the first cohort. These analyses shed additional light on the robustness of the emerging model.

Chapter 7
BASIC VALIDATION RESULTS FOR THE LVI SAMPLE

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This chapter summarizes the results of the validity evaluation of the ASVAB and the Project A Longitudinal Validation (LVI) Experimental Battery for predicting first-tour performance in the Army. The results are based on the first-tour performance data collected from the Project A/Career Force longitudinal sample. The objectives of the analyses described in this chapter are as follows:

(1) Compute the basic validities for ASVAB and Experimental Battery predictors against the first-tour performance factors and selected individual performance measures.

(2) Compare the validities of four alternative sets of ASVAB scores (nine ASVAB subtests vs. four ASVAB factor composites vs. AFQT vs. MOS-appropriate Aptitude Area composites).

(3) Compare the validities of three alternative sets of ABLE scores.

(4) Assess the incremental validities for the Experimental Battery predictors over the four ASVAB factor composites.

(5) Compare the incremental validities of three alternative sets of ABLE scores.

(6) Compare the validities and incremental validities of the Experimental Battery predictors under two different sample editing strategies.

(7) Compare the validities and incremental validities of the Experimental Battery predictors with the validities and incremental validities reported for CVI.

SAMPLE

The results reported in this chapter were based on two different sample editing strategies. The first mirrored the strategy used in evaluating the Project A CVI predictors against first-tour performance. To be included in those analyses, soldiers in the CVI sample were required to have complete data for all of the Project A CVI predictor composites, as well as for the ASVAB and each of the CVI first-tour performance factors. Corresponding to this strategy, a validation sample composed solely of soldiers having complete data for all the LVI Experimental Battery predictors, the ASVAB, and the LVI first-tour performance factors was created for the LVI data set. This sample is referred to as the "listwise deletion" sample.

Table 7.1 shows the number of soldiers across the 10 Batch A MOS who were able to meet the listwise deletion requirements. LVI first-tour performance measures were administered to 6,815 soldiers. Following final editing of the data, a total of 6,458 soldiers had complete data for all

Table 7.1

Missing Criterion and Predictor Data for Soldiers Administered LVI First-Tour Performance Measures

Number of Soldiers:

- in LVI Sample 6,815
- who have <u>complete</u> LVI criterion data 6,458
- <u>and</u> who have ASVAB scores 6,319
- <u>and</u> who were administered LV Experimental Battery (either paper-and-pencil <u>or</u> computer tests) 4,528
- <u>and</u> for whom no predictor data were missing 3,163

of the first-tour performance factors. The validation sample was further reduced due to missing predictor data from the ASVAB and the LVI Experimental Battery. Of the 6,319 soldiers who had complete criterion data <u>and</u> whose ASVAB scores were accessible, 4,528 were administered at least a portion of the Experimental Battery (either the paper-and-pencil tests, the computer tests, or both). Of these, the total number of soldiers with complete predictor data was 3,163.

The number of soldiers with complete predictor and criterion data in each MOS is reported in Table 7.2 for both the CVI and LVI data sets. With the exception of the 73 soldiers in MOS 19E, the soldiers in the right-hand column of the table form the LVI listwise deletion validation sample. 19E was excluded from the present analyses for three reasons. First, the sample size for this MOS was considerably smaller than that of the other Batch A MOS (e.g., the MOS with the next smallest sample had 172 soldiers). Second, the MOS is currently being phased out of operation. And third, the elimination of 19E creates greater correspondence between the CVI and LVI samples with respect to the composition of MOS (e.g., the ratio of combat to non-combat MOS).

In the alternative sample editing strategy, a separate validation sample was identified for each set of predictors in the Experimental Battery (see below). More specifically, to be included in the validation sample for a given predictor set, soldiers were required to have complete data for each of the first-tour performance factors, the ASVAB, and the predictor composites in that predictor set only. For example, a soldier who had data for the complete set of ABLE composites (as well as complete ASVAB and criterion data), but was missing data from the AVOICE composites, would have been included in the "setwise deletion" sample for estimating the validity of the former test, but not the latter.

Table 7.2

Soldiers in CVI and LVI Data Sets With Complete Predictor and First-Tour Criterion Data, by MOS

MOS		CVI	LVI (Listwise Deletion Sample)
11B	Infantryman	491	235
13B	Cannon Crewman	464	553
19E[a]	M60 Armor Crewman	394	73
19K	M1 Armor Crewman	---	446
31C	Single Channel Radio Operator	289	172
63B	Light-Wheel Vehicle Mechanic	478	406
71L	Administrative Specialist	427	252
88M	Motor Transport Operator	507	221
91A	Medical Specialist	392	535
95B	Military Police	597	270
Total		4,039	3,163

[a] MOS 19E not included in validity analyses.

There were two reasons for creating these setwise deletion samples. The first reason was to maximize the sample sizes used in estimating the validity of the Experimental Battery predictors. The number of soldiers in each MOS meeting the setwise deletion requirements for each predictor set is reported in Table 7.3. As can be seen, the setwise sample sizes are considerably larger than those associated with the listwise strategy.

Table 7.3

Soldiers in LVI Setwise Deletion Samples for Validation of Spatial, Computer, JOB, ABLE, and AVOICE Experimental Battery Predictor Composites, by MOS

	Setwise Deletion Samples				
MOS	Spatial	Computer	JOB	ABLE	AVOICE
11B	785	283	720	731	747
13B	713	670	657	753	673
19E[a]	88	86	83	80	87
19K	548	539	512	495	527
31C	221	204	208	200	208
63B	529	499	498	468	507
71L	328	302	300	291	287
88M	279	289	258	263	257
91A	643	619	613	597	625
95B	316	306	307	294	302
Total	4,450	3,797	4,156	4,072	4,220

[a] MOS 19E not included in validity analyses.

The second reason for using the setwise strategy stemmed from the desire to create validation samples that might be more representative of the examinees for whom test scores would be available under operational testing conditions. Under the listwise deletion strategy, soldiers were deleted from the validation sample for missing data from any of the tests included in the Experimental Battery. In many instances, these missing data could be attributed to scores for a given test being set to missing because the examinee failed to pass the random response index for that test, but not for any of the other tests.

It is unlikely, however, that all of the tests (and, hence, all of the random response indices) in the Experimental Battery would be used operationally at the same time. Under the setwise strategy, any examinee who would have failed the random response index for a test <u>not</u> administered, but who did <u>not</u> fail the random response indices for the tests that actually <u>were</u> administered, would not be identified as having suspect data. (For example, if the ABLE was operational as a selection device, but the AVOICE was not, it could not be known whether a given examinee would have passed the random response index associated with the AVOICE.) The advantage of the setwise deletion strategy is that none of the examinees removed from the validation sample for a given test were excluded solely for failing the random response index on a different test in the Experimental Battery.

As a final note, there is no reason to expect systematic differences between the results obtained with the listwise and setwise deletion samples. However, because of the greater sample sizes of the setwise deletion samples, as well as the possibly greater similarity between the setwise deletion samples and the future examinee population, it is possible that the validity estimates associated with these samples may be more accurate than those associated with the listwise deletion sample.

MEASURES

Predictors

The predictor scores used in these analyses were derived from the operationally administered ASVAB and the paper-and-pencil and computerized tests administered in the Project A LVI Experimental Battery. For the ASVAB, four types of scores were examined. These scores, listed in Table 7.4, include the nine ASVAB subtests (of which the Verbal score is a composite of the Paragraph Comprehension and Word Knowledge subtests), the four ASVAB factor composite scores, the AFQT, and the MOS-appropriate Aptitude Area composite scores.

The scores derived from the LVI Experimental Battery are listed in Table 7.5. With one exception, these scores are described in the Career Force first annual report (Campbell & Zook, 1990). The exception concerns the scores derived for the ABLE. Note that three different sets of ABLE scores are listed in Table 7.5. The first set, labeled the ABLE Rational Composites, were derived along with the other LV predictor composites. The other two sets, labeled ABLE-168 Composites and ABLE-114 Composites, were based on results of factor analyses of the ABLE items. Factor Scores (168) were scored

using 168 ABLE items, whereas Factor Scores (114) were scored using only 114 items. See Chapter 2 for a description of the development of the ABLE factor scores.

Table 7.4

Four Sets of ASVAB Scores Used in LVI First-Tour Validity Analyses

ASVAB Subtests

General Science
Arithmetic Reasoning
Verbal (Paragraph Comprehension + Word Knowledge)
Numerical Operations
Coding Speed
Auto/Shop Information
Mathematical Knowledge
Mechanical Comprehension
Electronic Information

ASVAB Factor Composites

Technical (Auto/Shop, Mechanical Comprehension, Electronics Information)
Quantitative (Math Knowledge, Arithmetic Reasoning)
Verbal (Word Knowledge, Paragraph Comprehension, General Science)
Speed (Coding Speed, Number Operations)

AFQT

Aptitude Area Composites (1 per MOS)

11B: CO (Combat)
12B: CO (Combat)
13B: FA (Field Artillery)
16S: OF (Operators/Foods)
19E: CO (Combat)
19K: CO (Combat)
27E: EL (Electronics)
29E: EL (Electronics)
31C: SC (Surveillance/Communications)
51B: GM (General Maintenance)
54B: ST (Skilled Technical)
55B: GM (General Maintenance)
63B: MM (Mechanical Maintenance)
67N: MM (Mechanical Maintenance)
71L: CL (Clerical)
76Y: CL (Clerical)
88M: OF (Operators/Foods)
91A: ST (Skilled Technical)
94B: OF (Operators/Foods)
95B: ST (Skilled Technical)
96B: ST (Skilled Technical)

Table 7.5

Sets of LVI Experimental Battery Predictor Scores Used in LVI First-Tour Validity Analyses

Spatial Composite	**ABLE Rational Composites**
Spatial	Achievement Orientation
	Adjustment
Computer Composites	Physical Condition
Psychomotor	Internal Control
Perceptual Speed	Cooperativeness
Perceptual Accuracy	Dependability
Number Speed and Accuracy	Leadership
Basic Speed	
Basic Accuracy	**ABLE-168 Composites**
Short-Term Memory	Locus of Control
Movement Time	Cooperativeness
	Dominance
JOB Composites	Dependability
Autonomy	Physical Condition
High Expectations	Stress Tolerance
Routine	Work Orientation
AVOICE Composites	**ABLE-114 Composites**
Administrative	Locus of Control
Audiovisual Arts	Cooperativeness
Food Service	Dominance
Structural/Machines	Dependability
Protective Services	Physical Condition
Rugged/Outdoors	Stress Tolerance
Social	Work Orientation
Skilled Technical	

Criteria

The first-tour performance measures collected from the LVI sample constitute a subset of the first-tour measures collected from the CVI sample. These measures include:

- Revised Hands-On job sample measures
- Revised Job Knowledge tests
- Army-wide BARS
- MOS-specific BARS
- Administrative indices of performance

These measures generated a set of 20 basic scores that were the basis for the LVI performance modeling analysis reported in Chapter 6. Those analyses indicated that the factor model developed with the CVI data yielded an adequate fit when applied to the LVI data. This model specified the existence of five substantive performance factors and two method factors ("written" and "ratings"). The two methods factors were defined to be

orthogonal to the substantive factors, but the correlations among the substantive factors were not so constrained.

The five substantive factors and the variables that are scored on each are listed in Table 7.6. As in the scoring of the CVI data, both a raw and a residual score were created for each substantive factor. The residual scores for the two "can do" performance factors (Core Technical Proficiency and General Soldiering Proficiency) were constructed by partialing out variance associated with the written method factor, and the residual scores for the three "will do" scores were constructed by removing variance associated with the ratings method factor.

Consistent with the procedures used for CVI, the GSP factor scores (raw or residual) created for soldiers in MOS 11B are treated as CTP scores in the validity analyses. (As has been explained elsewhere, tasks that are considered "general" to the Army for soldiers in most other MOS are considered central or "core" to soldiers in 11B.) In addition to the raw and residual performance factors and the two method factors, total scores from the Hands-On and Job Knowledge tests were also used in the validation analyses reported in this chapter.

Table 7.6

LVI First-Tour Performance Factors and the Basic Criterion Scores That Define Them

- **Core Technical Proficiency (CTP)**
  - Hands-On Test - MOS Specific Tasks
  - Job Knowledge Test - MOS Specific Tasks
- **General Soldiering Proficiency (GSP)**
  - Hands-On Test - Common Tasks
  - Job Knowledge Test - Common Tasks
- **Effort and Leadership (ELS)**
  - Admin. Index - Number of Awards and Certificates
  - Army-Wide BARS Overall Effectiveness Rating Scale
  - Army-Wide BARS Effort/Leadership Ratings Factor
  - Average of MOS BARS Ratings Scales
- **Maintaining Personal Discipline (MPD)**
  - Admin. Index - Number of Articles 15 and Flag Actions
  - Admin. Index - Promotion Grade Deviation Score
  - Army-Wide BARS Personal Discipline Ratings Factor
- **Physical Fitness and Military Bearing (PFB)**
  - Admin. Index - Physical Readiness Score
  - Army-Wide BARS Fitness/Bearing Ratings Factor

PROCEDURE

The analysis procedure consisted of the following steps:

A) Using the listwise deletion sample, multiple correlations between each set of predictor scores and the five raw substantive factor scores, their five residual factor scores, the two method factor scores, and the total scores from the hands-on and job knowledge tests were computed separately by MOS and then averaged.

   1) As indicated above, ASVAB was represented by

      a) The nine ASVAB subtest scores
      b) The four ASVAB factor scores
      c) The AFQT
      d) The MOS-appropriate Aptitude Area composite score

   2) ABLE was represented by three sets of scores:

      a) The seven rational scales developed for the Experimental Battery

      b) Seven empirical scales developed on the basis of a factor analysis that retained all of the items (and which used 168 of them)

      c) Seven empirical scales developed by using the results of the factor analysis to select the best items to reflect each factor (and which used only 114 items)

   3) Each of the other predictor sets was represented by a single set of scores as described above and in Table 7.5.

   Results were computed both with and without correcting for multivariate range restriction (Lord & Novick, 1968). Corrections for range restriction were made using the 9x9 intercorrelation matrix among the subtests in the 1980 Youth Population (DoD, 1982). All results were adjusted for shrinkage using Rozeboom's (1978) Formula 8.

B) Using the listwise deletion sample, incremental validities for each set of Experimental Battery predictors (e.g., AVOICE composites or computer composites) over the four ASVAB factor composites were computed against the same criteria used to compute the validities in Step A. Once again, the results were computed separately by MOS and then averaged. Also, the results were computed both with and without correcting for range restriction, and were adjusted for shrinkage using the Rozeboom formula.

C) Using the setwise deletion samples, multiple correlations and incremental validities (over the four ASVAB factor composites) between each set of Experimental Battery predictors and the criteria used in the first two steps were computed separately by MOS and then averaged. These results were corrected for range restriction and adjusted for shrinkage using the Rozeboom formula.

The results were then compared with the results obtained in steps A and B above.

D) Finally, once again using the listwise deletion sample, multiple correlations and incremental validities (over the four ASVAB factors) were computed for each set of predictors in the Experimental Battery, this time adjusting the results for shrinkage with the Claudy (1978) instead of the Rozeboom formula. This step was conducted to allow comparisons between the first-tour validity results associated with the longitudinal sample and those that had been reported for the concurrent sample (for which only the Claudy formula was used, e.g., McHenry, Hough, Toquam, Hanson, & Ashworth, 1990).

RESULTS

Multiple Correlations for ASVAB and LVI Experimental Battery Predictors (Based on Listwise Deletion Sample)

Multiple correlations for the four ASVAB factor composites, the single spatial composite, the eight computer composites, the three JOB composites, the seven ABLE composites, and the eight AVOICE composites are reported in Table 7.7. Using the listwise deletion sample, these results were computed separately by MOS and then averaged. These results have also been adjusted for shrinkage using the Rozeboom formula and corrected for range restriction. Results which have not been corrected for range restriction (but which have been adjusted for shrinkage) are reported in Table 7.8.

The results in Table 7.7 indicate that the four ASVAB factor composites were the best set of predictors for the raw CTP, GSP, ELS, and MPD performance factors, the residual CTP, GSP, ELS, and MPD performance factors, the written and ratings method factors, and the Hands-on and Job Knowledge total scores. The spatial composite and the eight computer composites were next in line, except for MPD, where the ABLE composites and spatial composite were next. The seven ABLE composites had the highest level of validity for predicting the raw and residual PFB factor, with the ASVAB factor composites second. A similar pattern of results was found for the uncorrected coefficients reported in Table 7.8.

The average multiple correlations (corrected and uncorrected for range restriction, respectively) for the four different sets of ASVAB scores are reported in Tables 7.9 and 7.10. The corrected results indicate that the four ASVAB factor composites consistently had higher validities than the other three sets of scores, whereas the AFQT tended to have the lowest validities.

On the other hand, for several criteria, the uncorrected correlations for the Aptitude Area composite scores (and sometimes for the AFQT composite) were greater than the uncorrected multiple correlations for the four ASVAB factors. (It should be noted that differences between the patterns of the corrected and uncorrected results could arise due to differences in range restriction across the factor scores and the Aptitude Area composites. Therefore, where differences between the two sets of results are reported, we believe that the corrected results should be given greater emphasis, since

Table 7.7

Mean of Multiple Correlations Computed Within-Job for LVI Listwise Deletion Sample for ASVAB Factors, Spatial, Computer, JOB, ABLE Composites, and AVOICE: Results Corrected for Range Restriction

Criterion[a]	No. of MOS[b]	ASVAB Factors [4]	Spatial [1]	Computer [8]	JOB [3]	ABLE Comp. [7]	AVOICE [8]
CTP (Raw)	9	62 (13)	57 (11)	47 (16)	29 (13)	21 (09)	38 (08)
GSP (Raw)	8	66 (07)	64 (06)	55 (08)	29 (13)	23 (14)	37 (07)
ELS (Raw)	9	37 (12)	32 (08)	29 (15)	18 (14)	13 (11)	17 (15)
MPD (Raw)	9	17 (13)	14 (11)	10 (16)	06 (13)	14 (11)	05 (10)
PFB (Raw)	9	16 (06)	10 (04)	07 (07)	06 (06)	27 (07)	05 (09)
CTP (Res)	9	46 (17)	42 (15)	29 (22)	17 (12)	08 (11)	28 (12)
GSP (Res)	8	51 (10)	51 (08)	41 (10)	18 (11)	12 (12)	26 (09)
ELS (Res)	9	46 (18)	41 (13)	37 (20)	23 (15)	21 (15)	24 (16)
MPD (Res)	9	18 (13)	14 (12)	08 (16)	07 (11)	13 (11)	06 (10)
PFB (Res)	9	20 (10)	12 (08)	09 (11)	07 (06)	28 (10)	09 (11)
Written	9	54 (13)	49 (12)	43 (18)	29 (16)	23 (12)	29 (14)
Ratings	9	12 (09)	09 (07)	07 (09)	06 (09)	03 (05)	02 (07)
HO-Total	9	50 (14)	48 (11)	38 (15)	18 (13)	11 (11)	28 (09)
JK-Total	9	71 (08)	65 (07)	58 (10)	36 (14)	31 (08)	41 (08)

Note: Adjusted for shrinkage (Rozeboom formula 8). Numbers in parentheses are standard deviations. Numbers in brackets are the numbers of predictor scores entering prediction equations. Decimals omitted.

[a] CTP = Core Technical Proficiency; GSP = General Soldiering Proficiency; ELS = Effort and Leadership; MPD = Maintaining Personal Discipline; PFB = Physical Fitness and Military Bearing; HO = Hands-On; JK = Job Knowledge.

[b] Number of MOS for which validities were computed.

Table 7.8

Mean of Multiple Correlations Computed Within-Job for LVI Listwise Deletion Sample for ASVAB Factors, Spatial, Computer, JOB, ABLE Composites, and AVOICE: Results Uncorrected for Range Restriction

Criterion	No. of MOS[a]	ASVAB Factors [4]	Spatial [1]	Computer [8]	JOB [3]	ABLE Comp. [7]	AVOICE [8]
CTP (Raw)	9	41 (09)	37 (08)	20 (12)	06 (06)	02 (03)	16 (11)
GSP (Raw)	8	46 (06)	46 (06)	26 (13)	06 (08)	05 (08)	14 (11)
ELS (Raw)	9	19 (08)	16 (04)	11 (11)	05 (09)	04 (06)	05 (08)
MPD (Raw)	9	09 (08)	08 (05)	04 (06)	01 (03)	13 (09)	00 (00)
PFB (Raw)	9	08 (09)	04 (03)	03 (05)	06 (06)	27 (07)	05 (08)
CTP (Res)	9	30 (09)	27 (09)	12 (10)	02 (04)	00 (00)	14 (14)
GSP (Res)	8	36 (04)	36 (03)	19 (11)	03 (06)	03 (06)	10 (09)
ELS (Res)	9	26 (12)	24 (05)	12 (10)	06 (08)	07 (09)	09 (06)
MPD (Res)	9	07 (08)	09 (04)	04 (08)	00 (00)	11 (10)	00 (00)
PFB (Res)	9	10 (09)	05 (04)	03 (06)	04 (05)	29 (09)	06 (10)
Written	9	29 (07)	28 (09)	13 (11)	08 (08)	05 (08)	04 (07)
Ratings	9	03 (05)	04 (03)	04 (07)	02 (05)	04 (07)	01 (02)
HO-Total	9	35 (06)	35 (05)	19 (11)	03 (06)	01 (02)	13 (10)
JK-Total	9	48 (09)	45 (08)	26 (11)	11 (09)	08 (10)	15 (10)

Note: Adjusted for shrinkage (Rozeboom formula 8). Numbers in parentheses are standard deviations. Numbers in brackets are the numbers of predictor scores entering prediction equations. Decimals omitted.

[a] Number of MOS for which validities were computed.

Table 7.9

Mean of Multiple Correlations Computed Within-Job for LVI Listwise Deletion Sample for ASVAB Subtests, ASVAB Factors, AFQT, and ASVAB MOS-Appropriate Aptitude Area: Results Corrected for Range Restriction

Criterion	No. of MOS[a]	ASVAB Subtests [9]	ASVAB Factors [4]	AFQT [1]	Aptitude Area[b] [1]
CTP (Raw)	9	61 (14)	62 (13)	57 (15)	61 (13)
GSP (Raw)	8	66 (07)	66 (07)	62 (08)	64 (08)
ELS (Raw)	9	34 (16)	37 (12)	34 (12)	37 (11)
MPD (Raw)	9	14 (15)	17 (13)	14 (15)	16 (14)
PFB (Raw)	9	10 (09)	16 (06)	12 (06)	11 (06)
CTP (Res)	9	45 (18)	46 (17)	39 (19)	46 (17)
GSP (Res)	8	50 (10)	51 (10)	45 (09)	49 (10)
ELS (Res)	9	44 (22)	46 (18)	43 (20)	46 (18)
MPD (Res)	9	13 (14)	18 (13)	15 (15)	17 (14)
PFB (Res)	9	15 (11)	20 (10)	15 (11)	14 (12)
Written	9	54 (14)	54 (13)	55 (12)	53 (14)
Ratings	9	09 (10)	12 (09)	11 (10)	12 (10)
HO-Total	9	49 (14)	50 (14)	43 (16)	48 (15)
JK-Total	9	71 (09)	71 (08)	69 (09)	70 (09)

Note: Adjusted for shrinkage (Rozeboom formula 8). Numbers in parentheses are standard deviations. Numbers in brackets are the numbers of predictor scores entering prediction equations. Decimals omitted.

[a] Number of MOS for which validities were computed.
[b] MOS-Appropriate Aptitude Area composite.

Table 7.10

Mean of Multiple Correlations Computed Within-Job for LVI Listwise Deletion Sample for ASVAB Subtests, ASVAB Factors, AFQT, and ASVAB MOS-Appropriate Aptitude Area: Results Uncorrected for Range Restriction

Criterion	No. of MOS[a]	ASVAB Subtests [9]	ASVAB Factors [4]	AFQT [1]	Aptitude Area[b] [1]
CTP (Raw)	9	40 (08)	41 (09)	36 (09)	41 (07)
GSP (Raw)	8	44 (08)	46 (06)	41 (07)	43 (05)
ELS (Raw)	9	15 (11)	19 (08)	17 (06)	20 (05)
MPD (Raw)	9	07 (07)	09 (08)	11 (06)	12 (05)
PFB (Raw)	9	06 (08)	08 (09)	07 (05)	06 (04)
CTP (Res)	9	28 (10)	30 (09)	25 (10)	31 (08)
GSP (Res)	8	34 (05)	36 (04)	30 (07)	34 (04)
ELS (Res)	9	24 (11)	26 (12)	24 (10)	27 (08)
MPD (Res)	9	03 (06)	07 (08)	13 (05)	12 (05)
PFB (Res)	9	05 (08)	10 (09)	08 (06)	07 (06)
Written	9	27 (12)	29 (07)	31 (06)	28 (09)
Ratings	9	02 (05)	03 (05)	05 (03)	05 (04)
HO-Total	9	33 (06)	35 (06)	29 (08)	34 (06)
JK-Total	9	46 (11)	48 (09)	46 (07)	46 (08)

Note: Adjusted for shrinkage (Rozeboom formula 8). Numbers in parentheses are standard deviations. Numbers in brackets are the numbers of predictor scores entering prediction equations. Decimals omitted.

[a] Number of MOS for which validities were computed.
[b] MOS-Appropriate Aptitude Area composite.

differences between measures with respect to range restriction will have been removed.)

The average multiple correlations for the three sets of ABLE scores are reported in Tables 7.11 and 7.12 (corrected and uncorrected, respectively). The multiple correlations for the second set of alternate ABLE factor scores (those based on the reduced set of items) were consistently higher than those for the other two. Note that the validities for the ABLE rational composites tended to be the lowest of the three sets of ABLE scores.

Incremental Validities for the Experimental Battery Predictors Over the ASVAB Factors (Based on Listwise Deletion Sample)

Incremental validity results for the Experimental Battery predictors over the ASVAB factors are reported in Tables 7.13 and 7.14. Table 7.13 reports the average multiple correlations of each set of Experimental Battery predictors in combination with the four ASVAB factors. These results, based on the listwise deletion sample, were adjusted for shrinkage using the Rozeboom formula and corrected for range restriction. Numbers that are underlined indicate validities higher than those obtained with the four ASVAB factor composites alone (which are reported in italics).

The results indicate that the spatial composite adds slightly to the prediction of the raw and residual Core Technical and General Soldiering performance factors, as well as to the written method factor and the Hands-on and Job Knowledge total scores. They also show that the seven ABLE composites contribute substantially to the prediction of the raw and residual Personal Discipline and Physical Fitness performance factors.

Incremental validity results which have not been corrected for range restriction (but which were adjusted for shrinkage) are reported in Table 7.14. The pattern of results in this table is similar to those reported in Table 7.13; however, the estimated level of incremental validity is actually higher for the results that have not been corrected for range restriction than for those for which the correction was made. The estimates are generally three points higher for CTP, GSP, and MPD, but about six points higher for PFB as incrementally predicted by ABLE.

The adjusted incremental validity results for each of the three sets of ABLE scores over the ASVAB factors are reported in Tables 7.15 and 7.16 (corrected and uncorrected for range restriction, respectively). All three sets of scores account for variance in the raw and residual Personal Discipline and Physical Fitness performance factors not predicted by the ASVAB factors. This incremental validity is slightly greater (up to two validity points) for the factor scores based on the reduced number (114) of ABLE items.

Table 7.11

Mean of Multiple Correlations Computed Within-Job for LVI Listwise Deletion Sample for ABLE Rational Composites, ABLE-168 Items, and ABLE-114 Items: Results Corrected for Range Restriction

Criterion	No. of MOS[a]	ABLE Composites [7]	ABLE-168 [7]	ABLE-114 [7]
CTP (Raw)	9	.21 (.09)	.25 (.07)	.26 (.10)
GSP (Raw)	8	.23 (.14)	.26 (.11)	.28 (.13)
ELS (Raw)	9	.13 (.11)	.15 (.12)	.16 (.12)
MPD (Raw)	9	.14 (.11)	.15 (.11)	.17 (.12)
PFB (Raw)	9	.27 (.07)	.27 (.07)	.27 (.07)
CTP (Res)	9	.08 (.11)	.12 (.09)	.16 (.12)
GSP (Res)	8	.12 (.12)	.14 (.14)	.19 (.14)
ELS (Res)	9	.21 (.15)	.21 (.15)	.22 (.17)
MPD (Res)	9	.13 (.11)	.14 (.12)	.17 (.11)
PFB (Res)	9	.28 (.10)	.29 (.10)	.28 (.10)
Written	9	.23 (.12)	.24 (.11)	.24 (.09)
Ratings	9	.03 (.05)	.03 (.05)	.03 (.04)
HO-Total	9	.11 (.11)	.13 (.12)	.18 (.12)
JK-Total	9	.31 (.08)	.32 (.08)	.33 (.09)

Note: Adjusted for shrinkage (Rozeboom formula 8). Numbers in parentheses are standard deviations. Numbers in brackets are the numbers of predictor scores entering prediction equations.

[a] Number of MOS for which validities were computed.

Table 7.12

Mean of Multiple Correlations Computed Within-Job for LVI Listwise Deletion Sample for ABLE Rational Composites, ABLE-168 Items, and ABLE-114 Items: Results Uncorrected for Range Restriction

Criterion	No. of MOS[a]	ABLE Composites [7]	ABLE-168 [7]	ABLE-114 [7]
CTP (Raw)	9	.02 (.03)	.03 (.06)	.01 (.02)
GSP (Raw)	8	.05 (.08)	.05 (.08)	.09 (.07)
ELS (Raw)	9	.04 (.06)	.07 (.07)	.07 (.08)
MPD (Raw)	9	.13 (.09)	.14 (.09)	.16 (.10)
PFB (Raw)	9	.27 (.07)	.28 (.07)	.27 (.07)
CTP (Res)	9	.00 (.00)	.01 (.02)	.01 (.02)
GSP (Res)	8	.03 (.06)	.04 (.06)	.05 (.07)
ELS (Res)	9	.07 (.09)	.08 (.09)	.08 (.09)
MPD (Res)	9	.11 (.10)	.13 (.10)	.15 (.10)
PFB (Res)	9	.29 (.09)	.29 (.10)	.28 (.11)
Written	9	.05 (.08)	.04 (.08)	.03 (.06)
Ratings	9	.04 (.07)	.04 (.06)	.03 (.05)
HO-Total	9	.01 (.02)	.02 (.03)	.03 (.05)
JK-Total	9	.08 (.10)	.08 (.10)	.09 (.10)

Note: Adjusted for shrinkage (Rozeboom formula 8). Numbers in parentheses are standard deviations. Numbers in brackets are the numbers of predictor scores entering prediction equations.
[a] Number of MOS for which validities were computed.

Table 7.13

Mean of Incremental Correlations Over ASVAB Factors Computed Within-Job for LVI Listwise Deletion Sample for Spatial, Computer, JOB, ABLE Composites, and AVOICE: Results Corrected for Range Restriction

Criterion	No. of MOS[a]	ASVAB Factors (A4) [4]	A4+ Spatial [5]	A4+ Computer [12]	A4+ JOB [7]	A4+ ABLE Comp. [11]	A4+ AVOICE [12]
CTP (Raw)	9	*62* (13)	63 (13)	61 (14)	61 (13)	61 (13)	62 (13)
GSP (Raw)	8	*66* (07)	68 (07)	66 (07)	66 (07)	66 (07)	66 (07)
ELS (Raw)	9	*37* (12)	36 (13)	35 (13)	36 (13)	34 (17)	33 (16)
MPD (Raw)	9	*17* (13)	16 (14)	16 (15)	14 (15)	23 (14)	10 (15)
PFB (Raw)	9	*16* (06)	13 (08)	09 (08)	17 (08)	30 (06)	12 (10)
CTP (Res)	9	*46* (17)	47 (17)	44 (18)	45 (18)	43 (19)	46 (19)
GSP (Res)	8	*51* (10)	53 (09)	51 (10)	50 (10)	50 (10)	50 (10)
ELS (Res)	9	*46* (18)	47 (18)	44 (21)	45 (21)	45 (22)	44 (21)
MPD (Res)	9	*18* (13)	15 (14)	15 (14)	14 (14)	22 (14)	12 (13)
PFB (Res)	9	*20* (10)	18 (12)	13 (11)	20 (11)	34 (10)	18 (13)
Written	9	*54* (13)	55 (13)	51 (18)	54 (13)	54 (12)	52 (17)
Ratings	9	*12* (09)	11 (08)	09 (10)	09 (10)	09 (08)	05 (08)
HO-Total	9	*50* (14)	52 (13)	49 (14)	49 (15)	48 (14)	49 (15)
JK-Total	9	*71* (08)	72 (08)	71 (09)	71 (08)	71 (08)	71 (08)

Note: Adjusted for shrinkage (Rozeboom formula 8). Numbers in parentheses are standard deviations. Numbers in brackets are the numbers of predictor scores entering prediction equations. Multiple Rs for ASVAB Factors alone are in italics. Underlined numbers denote multiple Rs greater than for ASVAB Factors alone. Decimals omitted.

[a] Number of MOS for which validities were computed.

Table 7.14

Mean of Incremental Correlations Over ASVAB Factors Computed Within-Job for LVI Listwise Deletion Sample for Spatial, Computer, JOB, ABLE Composites, and AVOICE: Results Uncorrected for Range Restriction

Criterion	No. of MOS[a]	ASVAB Factors (A4) [4]	A4+ Spatial [5]	A4+ Computer [12]	A4+ JOB [7]	A4+ ABLE Comp. [11]	A4+ AVOICE [12]
CTP (Raw)	9	*41* (09)	<u>42</u> (10)	38 (11)	40 (08)	38 (10)	40 (08)
GSP (Raw)	8	*46* (06)	<u>50</u> (05)	45 (09)	45 (06)	44 (07)	44 (08)
ELS (Raw)	9	*19* (08)	18 (08)	19 (09)	19 (09)	18 (10)	16 (10)
MPD (Raw)	9	*09* (08)	08 (07)	07 (07)	06 (07)	<u>17</u> (09)	04 (06)
PFB (Raw)	9	*08* (09)	07 (09)	06 (08)	<u>11</u> (09)	<u>28</u> (06)	08 (10)
CTP (Res)	9	*30* (09)	<u>31</u> (10)	27 (11)	29 (10)	25 (12)	29 (12)
GSP (Res)	8	*35* (04)	<u>39</u> (03)	34 (07)	35 (05)	33 (06)	34 (06)
ELS (Res)	9	*26* (12)	26 (11)	25 (11)	25 (11)	26 (12)	24 (10)
MPD (Res)	9	*07* (08)	06 (07)	07 (07)	04 (06)	<u>14</u> (11)	03 (04)
PFB (Res)	9	*10* (09)	09 (09)	07 (09)	<u>13</u> (09)	<u>30</u> (09)	09 (11)
Written	9	*29* (07)	<u>31</u> (08)	25 (11)	28 (07)	27 (10)	25 (11)
Ratings	9	*03* (05)	02 (04)	02 (03)	03 (04)	<u>04</u> (06)	00 (01)
HO-Total	9	*35* (06)	<u>37</u> (06)	33 (08)	34 (06)	31 (08)	33 (08)
JK-Total	9	*48* (09)	<u>50</u> (10)	45 (16)	48 (08)	48 (08)	46 (10)

Note: Adjusted for shrinkage (Rozeboom formula 8). Numbers in parentheses are standard deviations. Numbers in brackets are the numbers of predictor scores entering prediction equations. Multiple Rs for ASVAB Factors alone are in italics. Underlined numbers denote multiple Rs greater than for ASVAB Factors alone. Decimals omitted.

[a] Number of MOS for which validities were computed.

Table 7.15

Mean of Incremental Correlations Over ASVAB Factors Computed Within-Job for LVI Listwise Deletion Sample for ABLE Rational Composites, ABLE-168 Items, and ABLE-114 Items: Results Corrected for Range Restriction

Criterion	No. of MOS[a]	ASVAB Factors (A4) [4]	A4+ ABLE Comp. [11]	A4+ ABLE-168 [11]	A4+ ABLE-114 [11]
CTP (Raw)	9	*62* (13)	61 (13)	61 (13)	61 (13)
GSP (Raw)	8	*66* (07)	66 (07)	66 (07)	66 (07)
ELS (Raw)	9	*37* (12)	34 (17)	35 (17)	36 (15)
MPD (Raw)	9	*17* (13)	23 (14)	24 (14)	25 (14)
PFB (Raw)	9	*16* (06)	30 (06)	31 (06)	31 (06)
CTP (Res)	9	*46* (17)	43 (19)	44 (20)	44 (19)
GSP (Res)	8	*51* (10)	50 (10)	50 (10)	51 (10)
ELS (Res)	9	*46* (18)	45 (22)	45 (22)	45 (22)
MPD (Res)	9	*18* (13)	22 (14)	23 (14)	24 (14)
PFB (Res)	9	*20* (10)	34 (10)	34 (10)	34 (10)
Written	9	*54* (13)	54 (12)	54 (11)	53 (12)
Ratings	9	*12* (09)	09 (08)	09 (09)	09 (09)
HO-Total	9	*50* (14)	48 (14)	48 (14)	48 (15)
JK-Total	9	*71* (08)	71 (08)	71 (08)	71 (08)

Note: Adjusted for shrinkage (Rozeboom formula 8). Numbers in parentheses are standard deviations. Numbers in brackets are the numbers of predictor scores entering prediction equations. Multiple Rs for ASVAB Factors alone are in italics. Underlined numbers denote multiple Rs greater than for ASVAB Factors alone. Decimals omitted.

[a] Number of MOS for which validities were computed.

Table 7.16

Mean of Incremental Correlations Over ASVAB Factors Computed Within-Job for LVI Listwise Deletion Sample for ABLE Rational Composites, ABLE-168 Items, and ABLE-114 Items: Results Uncorrected for Range Restriction

Criterion	No. of MOS[a]	ASVAB Factors (A4) [4]	A4+ ABLE Comp. [11]	A4+ ABLE-168 [11]	A4+ ABLE-114 [11]
CTP (Raw)	9	*41* (09)	38 (10)	38 (10)	38 (10)
GSP (Raw)	8	*46* (06)	44 (07)	45 (07)	46 (06)
ELS (Raw)	9	*19* (08)	18 (10)	20 (10)	20 (10)
MPD (Raw)	9	*09* (08)	17 (09)	18 (10)	19 (09)
PFB (Raw)	9	*08* (09)	28 (06)	28 (06)	28 (06)
CTP (Res)	9	*30* (09)	25 (12)	25 (12)	25 (12)
GSP (Res)	8	*36* (04)	33 (06)	34 (06)	35 (05)
ELS (Res)	9	*26* (12)	26 (12)	27 (12)	27 (12)
MPD (Res)	9	*07* (08)	14 (11)	16 (10)	18 (09)
PFB (Res)	9	*10* (09)	30 (09)	30 (09)	30 (10)
Written	9	*29* (07)	27 (10)	27 (09)	26 (09)
Ratings	9	*03* (05)	04 (06)	05 (06)	05 (07)
HO-Total	9	*35* (06)	31 (08)	32 (08)	32 (07)
JK-Total	9	*48* (09)	48 (08)	48 (07)	48 (07)

Note: Adjusted for shrinkage (Rozeboom formula 8). Numbers in parentheses are standard deviations. Numbers in brackets are the numbers of predictor scores entering prediction equations. Multiple Rs for ASVAB Factors alone are in italics. Underlined numbers denote multiple Rs greater than for ASVAB Factors alone. Decimals omitted.

[a] Number of MOS for which validities were computed.

Multiple Correlations and Incremental Validities Over the ASVAB Factors for the Experimental Battery Predictors (Based on the Setwise Deletion Samples)

Multiple correlations for the spatial composite, the eight computer composites, the three JOB composites, the seven ABLE composites, and the eight AVOICE composites based on the setwise deletion samples described above are reported in Table 7.17. Like the validity results based on the listwise deletion sample reported in Table 7.7, these results have been adjusted for shrinkage using the Rozeboom formula and corrected for range restriction.

The multiple correlations computed with the setwise samples are very similar to those computed with the listwise sample. However, there is a consistent difference between the two sets of results; specifically, the multiple correlations based on the setwise samples are generally one to three validity points higher.

As noted earlier, we did not expect the validities to either increase or decrease systematically across the listwise and setwise deletion samples. Furthermore, we can offer no plausible theoretical or statistical explanation for these differences. Therefore, attempting to interpret these findings may not be appropriate.

Incremental validity results associated with the setwise deletion samples can be found in Tables 7.18 and 7.19. Table 7.18 reports the multiple correlations for the four ASVAB factors alone (as computed separately in each of the setwise deletion samples), whereas Table 7.19 reports the multiple correlations for the four ASVAB factors along with each set of predictors in the Experimental Battery. Numbers underlined in Table 7.19 indicate multiple correlations that are higher than those based on ASVAB alone. Once again, results are adjusted for shrinkage using the Rozeboom formula and corrected for range restriction.

The incremental idity results based on the setwise samples are practically identical to those based on the listwise sample. Again, the primary difference between the two sets of results is that the level of validities are sometimes one or two points lower for the listwise sample than for the setwise samples.

COMPARISON BETWEEN VALIDITY RESULTS OBTAINED WITH LONGITUDINAL AND CONCURRENT SAMPLES

The final set of results concern the comparison between the validity results associated with the longitudinal data (i.e., LVI) and those reported for the concurrent validation data (CVI). Table 7.20 reports the multiple correlations for the ASVAB factors and each set of experimental predictors as computed for the listwise sample in both data sets. Note that there are differences between the CVI and LVI data in the number of predictor composites included in some of the experimental predictor sets. In particular, for the CVI analyses there were only six computer composites, four ABLE composites, and six AVOICE composites.

Table 7.17

Mean of Multiple Correlations Computed Within-Job for LVI Setwise Deletion Samples for Spatial, Computer, JOB, ABLE Composites, and AVOICE

Criterion	No. of MOS[a]	Spatial [1]	Computer [8]	JOB [3]	ABLE Composites [7]	AVOICE [8]
CTP (Raw)	9	58 (11)	49 (16)	31 (13)	21 (09)	39 (07)
GSP (Raw)	8	65 (06)	55 (08)	32 (13)	24 (14)	38 (07)
ELS (Raw)	9	33 (08)	30 (15)	19 (14)	12 (11)	20 (12)
MPD (Raw)	9	14 (11)	10 (16)	06 (13)	15 (11)	05 (11)
PFB (Raw)	9	08 (04)	13 (07)	07 (06)	28 (07)	09 (09)
CTP (Res)	9	43 (15)	31 (22)	17 (12)	10 (11)	29 (09)
GSP (Res)	8	51 (08)	40 (10)	21 (11)	14 (12)	28 (09)
ELS (Res)	9	41 (13)	36 (20)	24 (15)	21 (15)	26 (06)
MPD (Res)	9	13 (12)	10 (16)	06 (11)	15 (11)	07 (13)
PFB (Res)	9	11 (08)	10 (11)	09 (06)	30 (10)	12 (10)
Written	9	51 (11)	46 (16)	31 (17)	25 (11)	32 (15)
Ratings	9	09 (08)	09 (09)	07 (08)	04 (06)	03 (07)
HO-Total	9	50 (11)	38 (15)	20 (13)	13 (11)	30 (07)
JK-Total	9	66 (07)	60 (10)	38 (14)	30 (08)	43 (08)

Note: Results corrected for range restriction and adjusted for shrinkage (Rozeboom formula 8). Numbers in parentheses are standard deviations. Numbers in brackets are the numbers of predictor scores entering prediction equations. Decimals omitted.

[a] Number of MOS for which validities were computed.

Table 7.18

Mean of Multiple Correlations Computed Within-Job for ASVAB Factors Within Each of the Five LVI Setwise Deletion Samples

Criterion	No. of MOS[a]	ASVAB Factor (Spatial) [4]	ASVAB Factor (Computer) [4]	ASVAB Factor (JOB) [4]	ASVAB Factor (ABLE Comp.) [4]	ASVAB Factor (AVOICE) [4]
CTP (Raw)	9	63 (10)	62 (11)	63 (11)	62 (12)	64 (11)
GSP (Raw)	8	66 (07)	65 (07)	67 (07)	66 (07)	67 (07)
ELS (Raw)	9	37 (10)	37 (12)	37 (11)	36 (11)	37 (11)
MPD (Raw)	9	16 (13)	15 (13)	15 (12)	16 (13)	16 (12)
PFB (Raw)	9	16 (08)	19 (05)	16 (07)	15 (09)	16 (09)
CTP (Res)	9	47 (12)	46 (13)	47 (14)	47 (14)	48 (13)
GSP (Res)	8	51 (06)	50 (08)	51 (08)	51 (08)	52 (07)
ELS (Res)	9	47 (12)	46 (15)	47 (14)	46 (14)	47 (14)
MPD (Res)	9	15 (13)	14 (12)	14 (13)	14 (14)	16 (13)
PFB (Res)	9	21 (10)	21 (09)	20 (09)	20 (11)	21 (10)
Written	9	56 (13)	55 (12)	58 (11)	55 (14)	56 (14)
Ratings	9	10 (10)	11 (11)	11 (08)	11 (10)	10 (10)
HO-Total	9	51 (09)	50 (11)	50 (12)	50 (11)	51 (10)
JK-Total	9	71 (09)	71 (08)	72 (08)	71 (09)	72 (09)

Note: Results corrected for range restriction and adjusted for shrinkage (Rozeboom formula 8). Numbers in parentheses are standard deviations. Numbers in brackets are the numbers of predictor scores entering prediction equations. Decimals omitted.

[a] Number of MOS for which validities were computed.

Table 7.19

Mean of Incremental Correlations Over ASVAB Factors Computed Within-Job for LVI Setwise Deletion Samples for Spatial, Computer, JOB, ABLE Composites, and AVOICE

Criterion	No. of MOS[a]	ASVAB Factors (A4) + Spatial [5]	A4+ Computer [12]	A4+ JOB [7]	A4+ ABLE Composites [11]	A4+ AVOICE [12]
CTP (Raw)	9	<u>64</u> (10)	61 (11)	63 (11)	61 (12)	64 (11)
GSP (Raw)	8	<u>69</u> (06)	<u>66</u> (07)	67 (07)	66 (08)	66 (07)
ELS (Raw)	9	37 (10)	36 (14)	37 (11)	36 (13)	36 (11)
MPD (Raw)	9	15 (13)	15 (15)	12 (13)	<u>24</u> (13)	11 (14)
PFB (Raw)	9	15 (08)	17 (05)	<u>17</u> (07)	<u>32</u> (04)	15 (10)
CTP (Res)	9	<u>48</u> (12)	45 (14)	46 (14)	45 (14)	47 (14)
GSP (Res)	8	<u>54</u> (06)	50 (08)	51 (08)	50 (07)	50 (07)
ELS (Res)	9	47 (12)	43 (20)	46 (15)	46 (15)	46 (14)
MPD (Res)	9	14 (13)	13 (15)	13 (13)	<u>22</u> (12)	11 (14)
PFB (Res)	9	20 (11)	18 (11)	20 (10)	<u>36</u> (08)	21 (11)
Written	9	<u>57</u> (13)	53 (17)	58 (12)	55 (13)	54 (18)
Ratings	9	10 (09)	<u>11</u> (11)	11 (09)	<u>11</u> (07)	06 (09)
HO-Total	9	<u>53</u> (09)	49 (11)	50 (12)	49 (11)	50 (11)
JK-Total	9	<u>73</u> (08)	71 (09)	72 (08)	71 (09)	71 (09)

Note: Results corrected for range restriction and adjusted for shrinkage (Rozeboom formula 8). Numbers in parentheses are standard deviations. Numbers in brackets are the numbers of predictor scores entering prediction equations. Underlined numbers denote multiple Rs greater than for ASVAB Factors alone (as reported in Table 7.18). Decimals omitted.

[a] Number of MOS for which validities were computed.

Table 7.20

Comparison of Mean Multiple Correlations Computed Within-Job for LVI and CVI Listwise Deletion Samples for ASVAB Factors, Spatial, Computer, JOB, ABLE Composites, and AVOICE: Results Corrected for Range Restriction and Adjusted for Shrinkage (Claudy Formula)

Criterion	No. of MOS[a]	ASVAB Factors LV [4]	ASVAB Factors CV [4]	Spatial LV [1]	Spatial CV [1]	Computer LV [8]	Computer CV [6]	JOB LV [3]	JOB CV [3]	ABLE Comp. LV [7]	ABLE Comp. CV [4]	AVOICE LV [8]	AVOICE CV [6]
CTP (Raw)	9	63	63	57	56	50	53	31	29	27	26	41	35
GSP (Raw)	8	67	65	64	63	57	57	32	30	29	25	40	34
ELS (Raw)	9	39	31	32	25	34	26	22	19	20	33	25	24
MPD (Raw)	9	22	16	14	12	15	12	11	11	22	32	11	13
PFB (Raw)	9	21	20	10	10	17	11	12	11	31	37	15	12
CTP (Res)	9	48	47	42	37	35	37	20	21	18	22	33	28
GSP (Res)	8	53	49	51	48	44	41	22	22	19	21	31	26
ELS (Res)	9	48	46	41	41	40	38	25	27	26	31	29	32
MPD (Res)	9	23	19	14	15	14	13	12	10	21	28	13	15
PFB (Res)	9	24	21	12	11	17	14	11	10	32	35	16	14
Written	9	56	62	49	55	47	54	31	28	29	21	33	32
Ratings	9	16	15	09	07	17	08	10	08	09	18	09	09

Note: Numbers in brackets are the numbers of predictor scores entering prediction equations. Decimals omitted.

[a] Number of MOS for which validities were computed.

The results in Table 7.20 have been adjusted for shrinkage and corrected for range restriction. As previously indicated, the adjustments for shrinkage in this step were all made using the Claudy formula, rather than the Rozeboom. This is because the CVI results have not been reported using the Rozeboom formula. The primary difference between the two corrections is that the Claudy formula estimates the multiple correlation of the population regression equation when applied to the population, whereas the Rozeboom estimates the multiple correlation of the sample-based regression equation when applied to the population.

In that the population regression equation cannot actually be obtained in an applied prediction situation, we believe that it is generally more appropriate to use the Rozeboom correction for estimating the level of validity of a set of predictors. However, because the relative sizes of the validity coefficients across the different predictor sets and criterion constructs should be unaffected by the particular adjustment formula used, the comparison between the LVI and CVI results based on the Claudy adjustment should be approximately the same as a comparison between these two sets of results based on the Rozeboom adjustment. Indeed, a comparison of the Claudy- and Rozeboom-adjusted results for the LVI sample shows that the pattern of results is almost identical (although, as would be expected, the level of validities is higher for the Claudy-adjusted results).

Overall Results

The results in Table 7.20 demonstrate that the patterns and levels of validities are very similar across the two sets of analyses. Still, there are several differences worth pointing out. Specifically, in comparison to the results of the CVI analyses: (a) the LVI validities of the "cognitive" predictors (i.e., ASVAB, spatial, computer) for predicting the "will do" performance factors (ELS, MPD, and PFB) are higher; (b) the LVI validities of the ABLE composites for predicting the "will do" performance factors are lower; and (c) the LVI validities of the AVOICE composites for predicting the "can do" performance factors (CTP and GSP) are higher. CVI results were not reported for the Hands-On and Job Knowledge total scores.

Finally, the incremental validity results for the CVI and LVI analyses for the five raw performance factors (CVI results were not reported for the other criteria) are reported in Table 7.21. The results are adjusted for shrinkage (again using Claudy) and corrected for range restriction. Once more, the results are very similar across the two sets of analyses. However, the LVI incremental validities associated with the ABLE were not quite as large as those reported in the CVI analyses.

Further Exploration of ELS and ABLE

As shown in the data reported above, the largest difference between the CVI and LVI validation results was in the prediction of the Effort and Leadership (ELS) performance factor with the ABLE basic scores. Corrected for restriction of range and for shrinkage, the validity of the four ABLE composite scores in CVI was .33 for ELS and the validity of the seven ABLE factor scores in LVI was .20. When cast against the variability in results across studies in the extant literature, such a difference may not seem all that large or very unusual. However, since the obtained results from CVI, CVII, and LVI have been so consistent, in terms of the expected convergent and divergent results, we

Table 7.21

Comparison of Mean Incremental Correlations Computed Within-Job for LVI and CVI Listwise Deletion Samples for ASVAB Factors, Spatial, Computer, JOB, ABLE Composites, and AVOICE: Results Corrected for Range Restriction and Adjusted for Shrinkage (Claudy Formula)

Criterion	No. of MOS[a]	ASVAB Factors LV *[4]*	ASVAB Factors CV *[4]*	Spatial LV [5]	Spatial CV [5]	Computer LV [12]	Computer CV [10]	JOB LV *[7]*	JOB CV *[7]*	ABLE Composites LV [11]	ABLE Composites CV [8]	AVOICE LV [12]	AVOICE CV [10]
CTP (Raw)	9	*63*	*63*	$\underline{64}$	$\underline{65}$	63	$\underline{64}$	63	63	63	63	$\underline{64}$	$\underline{64}$
GSP (Raw)	8	*67*	*65*	$\underline{69}$	$\underline{68}$	$\underline{68}$	$\underline{67}$	67	$\underline{66}$	$\underline{68}$	$\underline{66}$	$\underline{68}$	$\underline{66}$
ELS (Raw)	9	*39*	*31*	39	$\underline{32}$	$\underline{41}$	$\underline{32}$	$\underline{40}$	$\underline{33}$	$\underline{41}$	$\underline{42}$	$\underline{40}$	$\underline{35}$
MPD (Raw)	9	*22*	*16*	22	$\underline{17}$	$\underline{25}$	$\underline{17}$	22	$\underline{19}$	$\underline{31}$	$\underline{35}$	$\underline{24}$	$\underline{19}$
PFB (Raw)	9	*21*	*20*	20	$\underline{22}$	$\underline{23}$	$\underline{22}$	$\underline{24}$	$\underline{22}$	$\underline{35}$	$\underline{41}$	$\underline{24}$	$\underline{24}$

Note: Numbers in brackets are the numbers of predictor scores entering prediction equations. Multiple Rs for ASVAB Factors alone are in italics; underlined numbers denote multiple Rs greater than for ASVAB Factors alone. Decimals omitted.

[a] Number of MOS for which validities were computed.

subjected this particular difference to a series of additional analyses in an attempt to determine the source of the discrepancy.

Potential Causes

First, the discrepancy does not seem to arise from any general deterioration in the measurement properties of either the ABLE or the ELS composite in the LVI sample. For example, while the correlation of the ABLE with ELS and MPD went down, the ABLE's correlations with CTP and GSP went up slightly. Similarly, a decrease in the validity with which ELS is predicted is characteristic only of the ABLE. The validities of the cognitive measures, the JOB, and AVOICE for predicting ELS actually increased by varying amounts. Consequently, the decrease in validity seems to be specific to the ABLE/ELS correlation and, to a lesser extent, the ABLE/MPD correlation.

Other potential sources of the discrepancy that might exert more specific effects are the following:

- Differences in the way the ABLE was scored in CVI vs. LVI. The CVI ABLE composite was composed of four rationally defined construct scores while the seven LVI scores were defined by the results of a factor analysis (see Chapter 2).

- A possible response bias in the LVI ABLE that affects differentially the validities for predicting different components of performance.

- Different content for Effort/Leadership in CVI versus LVI. For example, the rating scales for expected combat performance were a part of ELS for CVI but not for LVI.

- Possible differences in the construct being measured by ELS in CVI versus LVI. That is, because of the rater/ratee cohort differences, the ratings may actually have somewhat different determinants.

In an effort to learn more about these potential sources of the discrepancy, a number of additional analyses were carried out. While obtaining a definitive answer would require additional experimentation and data collection, the available data base does provide a great deal of useful information, the most relevant aspects of which are summarized below.

Results of Followup Analysis

The followup analyses were able to rule out two possible additional sources of the CVI/LVI validity differences. First, differences in the composition and number of ABLE basic scores from CVI to LVI do not account for the differences in patterns of validity. We recomputed ABLE composites for the LVI data using the composite scoring rules from CVI to determine whether differences in CVI to LVI validities were related to the composition and number of ABLE composites. As shown in Table 7.22, the principal differences between LVI validities for the ABLE scored using CVI keys versus scored using LVI keys were: (a) validities against CTP and GSP dropped somewhat when the CVI key was used, but (b) there were no differences between CVI and LVI keyed validities for the "will do" criteria (i.e., validities did not go up when the CV key was used with LVI data).

Second, differences in the composition of the Effort/Leadership factor score from CVI to LVI do not account for differences in validity. The LVI-ELS criterion has fewer ratings than the CVI-ELS criterion did, making the weighting of Ratings to Awards smaller than it was in CVI. We reweighted the Rating and Awards components of ELS to make their relative contribution to the construct more similar to CVI. We then compared the validities resulting from both ELS scores. As shown in Table 7.22, there was essentially no difference between them.

The available evidence does not rule out two other possible explanations for the different ABLE/ELS correlations.

First, there may have been a change in the nature of the construct being measured by the ELS criterion components, which may account for the lower ABLE/ELS validity in the LVI sample. That is, the true score variance of the determinants of ELS might be different for CVI and LVI; for example, the sample shows greater variability in skill but more uniform levels of motivational determinants.

Table 7.22

Multiple Correlations, Averaged Over MOS, for Alternative Sets of ABLE Scores With Selected Criterion Scores in the LVI Sample

Criterion	ABLE Rational Composites (7)	ABLE-168	ABLE-114	ABLE Composites (4) LV	CV
CTP (Raw)	.27	.30	.31	.24	.26
GSP (Raw)	.29	.31	.33	.24	.25
ELS (Raw)	.20	.22	.24	.20	.33
EL2[a] (Raw)	.19	.21	.23	.20	--
MPD (Raw)	.22	.22	.24	.21	.32
PFB (Raw)	.31	.32	.31	.31	.37
CTP (Res)	.18	.21	.23	.17	.22
GSP (Res)	.19	.22	.25	.17	.21
ELS (Res)	.26	.27	.29	.23	.31
EL2[a] (Res)	.26	.27	.29	.22	--
MPD (Res)	.21	.22	.23	.20	.28
PFB (Res)	.32	.33	.33	.31	.35
Written	.29	.29	.29	.23	.21
Ratings	.09	.11	.12	.10	.18

Note. Corrected for restriction of range and adjusted for shrinkages.

[a] EL2 = LV recalculated on CV basis.

To address this issue, we compared the CVI versus LVI intercorrelations among the variables constituting the ELS criterion. The zero-order correlations between the components of ELS and the Hands-On, Job Knowledge, and ASVAB composite scores were also compared. As shown in Table 7.23, the LVI-ELS supervisor ratings correlate more highly with the three "non-Speed" ASVAB factor scores than did CVI-ELS supervisor ratings, suggesting a greater reliance on ability and skill determinants.

Second, there is evidence for the possible effects of some degree of response bias in the ABLE during the LVI data collection. Recall that the Experimental Battery was administered at the beginning of Basic Training just a few days after induction. The new recruits may easily have ascribed operational importance to the scores even though they were informed otherwise.

As shown in Table 7.24, the Social Desirability scale scores are almost one-half standard deviation higher for the LVI sample than for the CVI sample. Also, mean scores on some of the individual ABLE content scales are higher for the LVI sample than for the CVI sample. Internal Control, Traditional Values, Nondelinquency, Locus of Control, and Dependability yield the greatest CVI to

Table 7.23

Intercorrelations of the Four ASVAB Factors and the Basic Criterion Scores Within Effort/Leadership (ELS), Computed for Both CV1 and LV1 Samples

	Awards	Overall Effect. (P)	ELS Rating Comp. (P)	Overall Effect. (S)	ELS Rating Comp. (S)
CV1 Sample					
ELS Components					
Awards	1.00	.14	.17	.13	.15
Overall Effectiveness (Peer)	.14	1.00	.79	.38	.40
ELS Rating Composite (Peer)	.17	.79	1.00	.42	.46
Overall Eff. (Supv)	.13	.38	.42	1.00	.83
ELS Comp. (Supv)	.15	.40	.46	.83	1.00
HO Total	.12	.16	.22	.19	.24
JK Total	.06	.16	.21	.19	.24
Articles 15	-.01	-.21	-.21	-.23	-.21
Physical Readiness	.13	.13	.11	.11	.09
Promotion Rate	.08	.21	.21	.22	.21
ASVAB Factors					
Quantitative	.04	.07	.10	.10	.14
Speed	.02	.08	.07	.09	.08
Technical	.07	.11	.15	.10	.15
Verbal	.02	.03	.07	.04	.08
LV1 Sample					
ELS Components					
Awards	1.00	.14	.18	.15	.16
Overall Eff. (Peer)	.14	1.00	.78	.36	.36
ELS Comp. (Peer)	.18	.78	1.00	.40	.42
Overall Eff. (Supv)	.15	.36	.40	1.00	.84
ELS Comp. (Supv)	.16	.36	.42	.84	1.00
HO Total	.08	.14	.17	.22	.23
JK Total	.08	.13	.15	.24	.25
Articles 15	.07	.21	.22	.24	.22
Physical Readiness	.15	.13	.14	.11	.11
Promotion Rate	.10	.27	.27	.30	.29
ASVAB Factors					
Quantitative	.07	.08	.10	.13	.14
Speed	.03	.08	.04	.06	.06
Technical	.07	.13	.17	.16	.19
Verbal	.06	.06	.09	.07	.08

Note. Correlations are averaged across MOS.

Table 7.24

Means, Effect Sizes, and Ceiling Effects for ABLE Scale and Factor-Based Scores, CVI and LVI[a]

Score	No. of Items[b]	CV (N=8346) Mean	CV SD	CV Ceiling[c]	LV (N=7007) Mean	LV SD	LV Ceiling	Effect Size d[d]	Honest vs. Fake Good d[e]
Content Scales									
ABLE Scale 1: Emotional Stability	17	38.98	5.45	-.21	40.14	5.34	-.03	.22	.63
ABLE Scale 2: Self-Esteem	12	28.43	3.71	-.04	28.80	3.85	.13	.10	.66
ABLE Scale 3: Cooperativeness	18	41.89	5.28	-.29	44.41	4.92	.05	.49	.41
ABLE Scale 4: Conscientiousness	15	35.06	4.31	-.31	36.67	4.06	-.05	.38	.56
ABLE Scale 5: Nondelinquency	20	44.25	5.93	-.66	47.82	5.43	-.24	.63	.47
ABLE Scale 6: Traditional Values	11	26.60	3.72	.26	28.98	2.92	.62	.70	.44
ABLE Scale 7: Work Orientation	19	42.92	6.07	-.32	45.16	6.09	.05	.37	.69
ABLE Scale 8: Internal Control	16	38.02	5.11	.05	41.59	4.46	.56	.74	.31
ABLE Scale 9: Energy Level	21	48.44	5.97	-.44	50.41	5.94	-.12	.33	.73
ABLE Scale 10: Dominance	12	27.01	4.27	-.10	27.06	4.57	.04	.01	.70
ABLE Scale 11: Physical Condition	6	13.96	3.05	.67	13.42	2.96	.45	-.18	.71
Response Validity Scales									
ABLE Scale 12: Social Desirability	11	15.46	3.04		16.89	3.41		.45	.87
ABLE Scale 13: Self-Knowledge	11	25.45	3.33		26.21	3.13		.23	-.05
ABLE Scale 14: Non-Random Response	8	7.70	.57		7.68	.59		-.03	.17
ABLE Scale 15: Poor Impression	23	1.51	1.85		1.13	1.58		-.22	-.19
Factor-Based Scores									
Factor: Work Orientation (168 items)	45	104.69	12.29	-.47	109.82	12.31	-.05	.42	
Factor: Stress Tolerance (168 items)	29	66.61	8.52	.39	68.59	8.68	-.12	.23	
Factor: Dominance (168 items)	23	52.36	7.06	-.36	52.98	7.50	-.14	.09	
Factor: Dependability (168 items)	33	74.04	9.57	-.61	79.64	8.49	-.28	.62	
Factor: Locus Control (168 items)	17	41.41	5.44	.24	45.47	4.37	.74	.81	
Factor: Cooperate (168 items)	16	37.36	4.82	-.21	39.58	4.48	.12	.48	
Factor: Physical Condition (168 items)	8	18.90	3.55	.56	18.31	3.48	.36	-.17	
Factor: Work Orientation (114 items)	28	64.53	8.73	-.22	67.73	8.60	.11	.37	
Factor: Stress Tolerance (114 items)	15	34.90	5.13	.01	35.69	5.03	.15	.18	
Factor: Dominance (114 items)	19	42.72	6.16	-.32	43.16	6.57	-.11	.07	
Factor: Dependability (114 items)	21	48.19	7.06	-.10	52.24	6.15	.25	.61	
Factor: Locus Control (114 items)	13	31.92	4.57	.43	35.33	3.51	.96	.85	
Factor: Cooperate (114 items)	10	23.54	3.39	.10	25.09	3.01	.37	.48	
Factor: Physical Condition (114 items)	8	18.90	3.55	.56	18.31	3.48	.36	-.17	

[a] CV and LV samples have been edited for missing data and random responding. Only individuals with complete ABLE data are included.
[b] CV and LV data are scored on the same keys. The keys for CV and LV do not differ in number of items.
[c] The difference between the point two standard deviations above the mean and the maximum possible number of points in SD units. That is, Ceiling effect = (MN + 2*SD - Maximum Possible)/SD. Higher positive values suggest a ceiling effect.
[d] The standardized difference between CV and LV scores. Positive effect sizes occur when LV scores are higher than CV. $d = (MN_{LV} - MN_{CV})/S_{POOLED}$.
[e] From Hough et al. (1990). Honest condition N = 111-119. Fake good condition N = 46-48. Positive effect sizes indicate higher scores by the Fake Good condition.

LVI differences. In contrast, there were no differences between the samples on Dominance, and the CVI sample outscored the LVI sample on the Physical Condition scale.

The pattern of CVI to LVI differences in means on the content scales is quite different from those observed during the Trial Battery faking experiment (i.e., the comparison between Honest vs. Fake Good experimental instructions) conducted during the Trial Battery field tests (Peterson, 1987). In the Faking Good condition, the participants changed in the positive direction on all the scales at about the same magnitude, whereas CVI versus LVI differences vary by scale. Dominance, for example, was strongly faked good (effect size = .70) in the faking study, while there was no difference between CVI and LVI on this scale.

A "ceiling effect" occurs when most people obtain high scores on a test. For the CVI sample, the only scale with a ceiling effect was Physical Condition. For the LVI data, the largest ceiling effects occur for Traditional Values and Internal Control, and from the factor-based scores, for Locus of Control. In short, variance is attenuated on these scales.

The correlations between Social Desirability and the content scales are also higher for the LVI sample by about .10. Consider, for example, the 168-item factor-based score version of the ABLE. Correlations between Social Desirability and the content scales for the CVI sample ranged from .08 to .34 with a mean of .20; for the LVI sample, these correlations ranged from .16 to .42 with a mean of .29 (see Table 7.25).

Table 7.25

Correlations Between ABLE Factor-Based Scores and ABLE Social Desirability Scale

		ABLE-168 Items	ABLE-114 Items
CV Sample	Range of r	.08-.34	.08-.31
	Mean r	.20	.18
LV Sample	Range of r	.16-.42	.16-.42
	Mean r	.29	.25

We also compared CVI and LVI intercorrelations for a variety of sets of ABLE scores: (a) composites formed using CV rules, (b) composites formed using LV rules, and (c) composites formed using the two factor-based scoring keys. Regardless of the scoring method used, LVI correlations are about .06 to .10 higher than those from CVI data (see Tables 7.26 - 7.29.)

Table 7.26

Correlations Between ABLE Composites Computed With CV and LV Rules on the Concurrent Validation Sample[a]

	CV Composites				LV Composites						
	Surg	Depend	Adjust	Physical	Achieve	Lead	Depend	Adjust	Coop	Int C	Physical
CV Composites[b]											
Surgency (CV Rules)	1.00										
Dependability (CV Rules)	59	1.00									
Adjustment (CV Rules)	58	34	1.00								
Physical Condition (CV Rules)	.36	13	23	1.00							
LV Composites[c]											
Achievement Orientation (LV rules)	1.00	59	.58	36	1.00						
Leadership (LV rules)	.65	32	42	.31	.65	1.00					
Dependability (LV rules)	57	96	32	.12	.57	31	1.00				
Adjustment (LV rules)	58	34	1.00	23	.58	42	.32	1.00			
Cooperativeness (LV rules)	.55	55	50	18	.55	33	.55	.50	1.00		
Internal Control (LV rules)	53	46	.40	.12	.53	30	50	.40	.42	1.00	
Physical Condition (LV rules)	.36	13	23	1.00	.36	.31	.12	.23	.18	.12	1.00
Response Scales											
Social Desirability	.28	35	15	.08	.28	.13	.34	.15	.25	.08	.08
Self-Knowledge	.36	31	06	15	.36	.30	.30	06	.24	.23	.15
Non-Random Response	.08	10	.10	01	.08	05	.11	10	.12	.17	.01
Poor Impression	-.43	-.42	-.58	-.17	-.43	-.24	-.42	-.58	-.46	-.41	-.17

[a] CV sample after editing for missing data. Only individuals with complete ABLE data are included. N = 8343.

[b] Surgency includes Self-Esteem, Work Orientation, and Energy Level. Dependability includes Conscientiousness and Nondelinquency. Adjustment includes Emotional Stability, and Physical Condition contains only the scale Physical Condition.

[c] Achievement Orientation includes Self-Esteem, Work Orientation, and Energy Level. Leadership Potential includes only Dominance. Dependability includes Traditional Values, Conscientiousness, and Nondelinquency. Adjustment includes Emotional Stability. Cooperativeness, Internal Control, and Physical Condition each subsume only one scale, the scale with the same name.

Table 7.27

Correlations Between ABLE Composites Computed With CV and LV Rules on a Longitudinal Validation Sample[a]

	CV Composites				LV Composites						
	Surg	Depend	Adjust	Physical	Achieve	Lead	Depend	Adjust	Coop	Int C	Physical
CV Composites[b]											
Surgency (CV Rules)	1 00										
Dependability (CV Rules)	65	1 00									
Adjustment (CV Rules)	69	45	1 00								
Physical Condition (CV Rules)	48	23	36	1 00							
LV Composites[c]											
Achievement Orientation (LV rules)	1 00	65	69	48	1 00						
Leadership (LV rules)	67	38	53	.36	.67	1 00					
Dependability (LV rules)	63	95	43	.22	.63	37	1.00				
Adjustment (LV rules)	69	45	1 00	36	.69	53	.43	1 00			
Cooperativeness (LV rules)	61	63	55	24	.61	40	.63	55	1 00		
Internal Control (LV rules)	56	53	.47	.21	.56	.35	.56	47	49	1.00	
Physical Condition (LV rules)	48	23	.36	1 00	.48	.36	.22	36	.24	.21	1.00
Response Scales											
Social Desirability	.38	45	.26	.16	.38	.21	.41	.26	.34	.16	.16
Self Knowledge	.26	.22	06	.13	.26	.23	.22	.06	.19	.18	.13
Non Random Response	09	.17	10	01	.09	03	.18	.10	.15	.24	.01
Poor Impression	-.49	-.42	-.59	-.27	-.49	-.31	-.43	-.59	-.44	-.43	-.27

[a] An LV sample after editing for missing data. Only individuals with complete ABLE data are included N = 7025.

[b] Surgency includes Self-Esteem, Work Orientation, and Energy Level. Dependability includes Conscientiousness and Nondelinquency. Adjustment includes Emotional Stability, and Physical Condition contains only the scale Physical Condition.

[c] Achievement Orientation includes Self-Esteem, Work Orientation, and Energy Level. Leadership Potential includes only Dominance. Dependability includes Traditional Values, Conscientiousness and Nondelinquency. Adjustment includes Emotional Stability. Cooperativeness, Internal Control, and Physical Condition each subsume only one scale, the scale with the same name.

Table 7.28

Correlations Between ABLE Factor-Based Scores on CV Data

	WRK1	STB1	DMN1	DPN1	CNT1	COP1	PCD1	WRK2	STB2	DMN2	DPN2	CNT2	COP2	PCD2
168 - Item Score														
WRK1: Work Orientation	1.00													
STB1: Stress Tolerance	.54	1.00												
DMN1: Dominance	.65	.54	1.00											
DPN1: Dependability	.53	.33	.26	1.00										
CNT1: Locus of Control	.52	.38	.31	.44	1.00									
COP1: Cooperativeness		.53	.51	.41	.49	.39	1.00							
PCD1: Physical Condition	.34	.29	.39	.10	.12	.21	1.00							
114 - Item Score														
WRK2: Work Orientation	.96	.48	.64	.44	.50	.48	.33	1.00						
STB2: Stress Tolerance	.39	.92	.39	.26	.28	.41	.22	.32	1.00					
DMN2: Dominance	.61	.50	.98	.23	.28	.37	.38	.60	.36	1.00				
DPN2: Dependability	.49	.33	.22	.97	.42	.48	.07	.40	.27	.19	1.00			
CNT2: Locus of Control	.53	.40	.33	.43	.96	.40	.13	.51	.30	.30	.41	1.00		
COP2: Cooperativeness	.43	.44	.31	.46	.33	.93	.16	.38	.35	.28	.45	.33	1.00	
PCD2: Physical Condition	.34	.29	.39	.10	.12	.21	1.00	.33	.22	.38	.07	.13	.16	1.00
Social Desirability (11 items)	.32	.13	.15	.34	.13	.22	.08	.31	.10	.14	.30	.14	.20	.08

Note. N = 8,346

Table 7.29

Correlations Between ABLE Factor-Based Scores on LV Data

	WRK1	STB1	DMN1	DPN1	CNT1	COP1	PCD1	WRK2	STB2	DMN2	DPN2	CNT2	COP2	PCD2
168 - Item Score														
WRK1 Work Orientation	1.00													
STB1 Stress Tolerance	66	1.00												
DMN1 Dominance	68	65	1.00											
DPN1 Dependability	59	44	33	1.00										
CNT1 Locus of Control	52	42	32	49	1.00									
COP1 Cooperativeness	61	[illegible]	48	57	44	1.00								
PCD1 Physical Condition	45	44	48	.19	.19	.28	1.00							
114 - Item Score														
WRK2 Work Orientation	96	61	67	53	49	.57	44	1.00						
STB2 Stress Tolerance	54	93	53	38	35	.48	37	.49	1.00					
DMN2 Dominance	64	62	98	30	29	.45	.46	.64	.50	1.00				
DPN2 Dependability	52	40	26	96	.47	.53	.14	.45	35	.24	1.00			
CNT2 Locus of Control	.53	.44	.34	.47	.95	.44	.20	.50	.37	.31	45	1.00		
COP2 Cooperativeness	50	48	.37	.52	36	.92	.22	.46	.40	.34	.49	.36	1.00	
PCD2 Physical Condition	.45	.44	.48	19	.19	.28	1.00	.44	.37	.46	.14	.20	.22	1.00
Social Desirability (11 items)	.42	27	25	40	.18	.32	.16	.42	.24	.22	.34	.18	.28	.16

Note N = 7,007

A Limited Conclusion

In general, the somewhat lower correlation of ABLE with Effort/Leadership in LVI seems due to the joint effects of two influences. First, the determinants of ELS scores seem to favor ability slightly more and motivation slightly less in LVI versus CVI, perhaps because their true score variances are different across the two cohorts. Second, the greater influence of the social desirability response tendency in LVI seems to produce more positive manifold (i.e., higher intercorrelations for the LVI ABLE basic scores), as contrasted with CVI. This could also lower the correlation of the regression-weighted ABLE composite with ELS, whereas it might not have the same effect with the Core Technical and General Soldiering factors.

Yet another component of the explanation is the negative correlation between the Social Desirability scale and AFQT. As shown in Table 7.30, the high Social Desirability responders tend to have lower AFQT scores. AFQT and Social Desirability correlated -.22 in the CV sample and -.20 in the LV sample. This would tend to lower the correlation between ABLE and ELS if the correlations between ABLE and ASVAB and between ASVAB and ELS are positive, which they are.

The above conclusions must remain tentative because the effects are small and correlation does not imply causation. Obtaining a definitive answer would require the experimental manipulation of both performance determinants and response sets, which is beyond the scope of this report.

Table 7.30

Mean AFQT Scores for Accurate and High Social Desirability Responders in a Longitudinal Validation Sample

	All		Accurate[a]		High[b]	
MOS	N	Mean	N	Mean	N	Mean
11B	235	60.02	174	61.59	61	55.54
13B	551	47.15	355	50.02	196	41.96
19K	445	60.96	305	62.80	140	56.94
31C	172	64.24	136	66.47	36	55.81
63B	406	50.72	296	53.03	110	44.50
71L	251	55.21	180	56.70	71	51.44
88M	221	46.64	162	48.61	59	41.24
91A	535	62.05	388	63.78	147	57.50
95B	270	62.23	211	62.93	59	59.73

[a]Social Desirability score less than 18.2.
[b]Social Desirability score greater than or equal to 18.2.

SUMMARY AND CONCLUSIONS

The preceding analyses of basic validation results for the LVI sample produced a number of noteworthy findings in relation to the objectives that guided this round of analyses.

Generally speaking, the ASVAB was the best predictor of performance. However, the composite of spatial tests provided a small amount of incremental validity for the "can do" criteria (1-3 points), and the ABLE provided larger increments (7-20 points) for two of the three "will do" criteria (Maintaining Personal Discipline, and Physical Fitness and Bearing). Note that the estimates of incremental validity were somewhat higher when the results were <u>not</u> corrected for range restriction.

With regard to the ASVAB and options in using subtest scores to form prediction equations, results here indicate highly similar results across four methods, with a very slight edge going to multiple regression equations using the four ASVAB factor scores in the equation. These factors are unit-weighted composites of the ASVAB subtests.

In the test of several ABLE scoring options, the method using factor scores computed from a subset of all the ABLE items proved to have generally higher validities, but the difference was not large. The availability of a version that is at least as valid, but shortened, of this biodata/temperament instrument is gratifying.

In the comparison of sample editing strategies, the use of setwise deletion of examinees (versus listwise) substantially increased the samples available for validation analyses. The validation results showed similar patterns across the two methods, but the coefficients computed on the setwise samples were about one to three points higher.

Perhaps the most interesting finding in this evaluation of predictors derived from the comparisons between the Longitudinal Validation results and those from the Concurrent Validation. Such comparisons are rarely accomplished, because it is extremely difficult to conduct a concurrent validation and longitudinal validation study in the same organization on the same set of varied jobs using essentially the same predictors and criteria. The rarity increases because the sets of both predictors and criteria used in the present research are both very comprehensive and carefully developed <u>and</u> the achieved sample sizes are impressive. Aside from the concurrent versus longitudinal design difference, only cohort differences (both examinees and raters/scorers) can explain any disparities in the validation results.

Generally speaking, the pattern and level of the validity coefficients are highly similar across the two samples. The correlation between the CV and LV coefficients in Table 7.20 is .962 and the root mean squared difference between the two sets of coefficients is .046.

Note, however, that the correlation is not 1.00, nor is the RMS difference zero. As we noted above, the longitudinal validities are higher for cognitive predictors against "will do" criteria and lower for ABLE composites against "will do" criteria. Some of the possible explanations for those differences include changes in the nature of predictor scores when administered in a longitudinal versus concurrent design, changes in criterion

or predictor scores due to cohort differences, and changes in the true relationship between abilities and performance as persons gain more experience and training in an organization and job. These and other possible explanations will be explored in future analyses.

Chapter 8
RESULTS OF THE SECOND-TOUR VALIDATION (CVII)

John P. Campbell and Jeffrey W. Johnson

This chapter is a report on the validity of ASVAB and ABLE for predicting performance as a noncommissioned officer (NCO) in the second tour of duty. The results are based on the CVII sample which, as per the original design of Project A, was assessed on the criterion measures of second-tour performance at the same time that the LVI performance data were collected from the first-tour longitudinal sample.

The predictor set is limited to ASVAB and ABLE because only a small proportion (approximately 12 percent) of the CVII sample has been assessed with the Experimental Predictor Battery. ASVAB scores, taken 5-6 years earlier, were available from the Enlisted Master File. The ABLE was administered currently during the CVII data collection to approximately 45 percent of the total sample (i.e., those individuals who had no peers in the sample to rate and thus had time to take the ABLE). Everyone in the sample was assessed on the full set of second-tour performance measures. By design, the MOS in the CVII sample were limited to the MOS in Batch A.

Because of the generally small samples for individual MOS, results for most analyses are reported for the combined sample. Selected results are reported for clusters of MOS (combat, technical, and support).

OBJECTIVES

The objectives of the CVII validation were as follows:

(1) Compute the basic validities for ASVAB and ABLE against the performance factor scores and selected individual performance measures.

(2) Compute the incremental validities for ABLE over ASVAB.

(3) Compare the validities of three alternative sets of ABLE scores.

(4) Compare the results of using the four ASVAB factors vs. the nine ASVAB subtests in a weighted predicted composite.

(5) Evaluate the effects on validities of using unit weights.

(6) Using scores from ASVAB and ABLE, determine the "optimal" prediction equation for each performance factor.

(7) Determine the generalizability of prediction equations across performance factors (using the combined sample).

(8) For each performance factor, determine the generalizability of the optimal prediction equation in a specific MOS cluster to other MOS clusters.

THE SAMPLE

The CVII data collection and data preparation are described in the first annual report for Building the Career Force (Campbell & Zook, 1990; see Chapters 5 and 6). After final editing, the total N for CVII was 1,053. The total sample was distributed across the Batch A MOS as shown in Table 8.1.

Table 8.1

CVII Sample Sizes by MOS

MOS		N
11B	Infantryman	127
13B	Cannon Crewman	162
19E	M60 Armor Crewman	33
19K	M1 Armor Crewman	10
31C	Single Channel Radio Operator	103
63B	Light-Wheel Vehicle Mechanic	116
71L	Administrative Specialist	112
88M	Motor Transport Operator	144
91A	Medical Specialist	146
95B	Military Police	141
Total		1,053

Because of some missing data, the sample sizes varied depending on the specific analysis being reported. For example, for the reasons cited in the introduction, ABLE scores were available only for 477 individuals. Consequently, all the analyses that require a common covariance matrix for ABLE and ASVAB are based on this reduced sample.

PERFORMANCE CRITERION MEASURES

The CVII performance measures have been described previously (e.g., Campbell & Zook, 1990; Campbell, 1991). For informational purposes, they are listed below.

- Revised Hands-On (HO) job sample measures (a sample of Army-wide and MOS- specific technical tasks that had been developed for first-tour testing and was revised on the basis of the second-tour job analyses).

- Revised Job Knowledge (JK) tests.

- The leader Situational Judgment Test (SJT).

- Revised Army-wide rating scales (BARS).

- Newly developed Army-wide scales for the critical components of leadership and supervision that were identified in the second-tour job analyses.

- Revised predicted combat performance rating scales (males only).

- Administrative indices of performance.

- Three simulation (role-play) exercises of approximately 20 minutes each, designed to assess performance in three specific face-to-face leadership situations (performance counseling, personal counseling, individual remedial training).

These measures generated a set of 20 basic scores that were the basis for the CVII performance modeling analysis.

THE CVII PERFORMANCE MODEL

The development of the CVII performance model has been described previously and is summarized in the Building the Career Force first annual report (Campbell & Zook, 1990). The solution that yielded the best fit consisted of six substantive factors and two methods factors. The two methods factors were defined to be orthogonal to the substantive factors, but the correlations among the substantive factors were not so constrained. The six substantive factors and two methods factors, and the variables that are scored on each, are shown in Figure 8.1.

A number of suggested modifications were evaluated to see whether they produced a better fit. For example, Lloyd Humphreys (personal communication, 1990) suggested that the Personal Discipline (MPD) factor was really not very distinct and perhaps should not constitute a separate score. Our own exploratory factor analyses concurred with his in that the factor solutions provide little evidence for such a factor. However, the a priori model that included the factor provided a slightly better fit in the confirmatory analysis than one that did not include it and we elected to keep it as a separate performance factor, at least for some of the initial analyses.

A principal difference between the exploratory and confirmatory analyses is that the two orthogonal methods factors were part of the a priori model specifica-tions for the confirmatory analysis. We are also mindful of the fact that even if two variables intercorrelate .95 they can still have very different correlations with a third variable (McCormack, 1956). Consequently, while the MPD factor probably doesn't mean the same thing in second tour as it did in first tour and its variance may be considerably less (i.e., many of the people who get in trouble are gone), and it is difficult to distinguish from the Effort/Leadership (ELS) factor, it is analyzed as a separate criterion factor in the basic validation. The composite of ELS and MPD is also used as a criterion factor. Thus, we "did it both ways."

Another interesting result of the modeling analysis was that the Situational Judgment Test fit best in the ELS factor, as it theoretically should, even though it is a paper-and-pencil measure. Also, when the

intercorrelations among the criterion factor scores are examined, the role-play factor clusters with the proficiency (CTP and GSP) factors to form a higher order "can do" factor even though the scoring system depends on observed ratings.

- **Core Technical Proficiency (CTP)**
  - Hands-On Test - MOS-Specific Tasks
  - Job Knowledge Test - MOS-Specific Tasks
- **General Soldiering Proficiency (GSP)**
  - Hands-On Test - Common Tasks
  - Job Knowledge Test - Common Tasks
- **Effort and Leadership (ELS)**
  - Admin. Index - Number of Awards and Certificates
  - Admin. Index - Number of Training Courses Taken
  - Admin. Index - Promotion Grade Deviation Score
  - Army-Wide BARS Leadership Ratings Factor
  - Army-Wide BARS Technical Ratings Factor
  - Average of MOS BARS Ratings Scales
  - Situational Judgment Test Total Score
- **Maintaining Personal Discipline (MPD)**
  - Admin. Index - Number of Articles 15, Flag Actions (reversed)
  - Army-Wide BARS Personal Discipline Rating Scale
- **Physical Fitness/Military Bearing (PFB)**
  - Admin. Index - Physical Readiness Score
  - Army-Wide BARS Fitness/Bearing Ratings Factor
- **Training and Counseling Subordinates (TCS)**
  - Simulation Exercise - Personal Counseling Content
  - Simulation Exercise - Personal Counseling Process
  - Simulation Exercise - Disciplining Content
  - Simulation Exercise - Disciplining Process
  - Simulation Exercise - Training

* * *

- **Written Methods Factor (WM)**
  - Job-Specific Knowledge
  - Common Soldiering Knowledge
  - Situational Judgment Test
- **Ratings Method Factor (RM)**
  - Four Army-Wide BARS Ratings Factors
  - MOS BARS Average

Figure 8.1. The latent variables in the CVII Performance Model and the basic criterion scores that define them.

The complete basic validation analyses utilize a total of 10 scores for the performance factors, as shown below.

(1) TCS　(2) CTP　(3) GSP　(4) ELS　(5) MPD　(6) PFB

(7) (CTP + GSP)　(8) (ELS) + MPD)

(9) (TCS + CTP + GSP)　10) (ELS + MPD + PFB)

That is, all 10 scores are used as criterion measures. All higher order composite scores were obtained by standardizing the component scores and then taking the simple sum.

VALIDATION PROCEDURE

The CVII validation analysis procedure consisted of the following steps:

A) The ASVAB and ABLE were correlated with the six performance factor scores, their five residual scores (there was no residual for TCS), the higher order factor composites, the two methods factor scores, and the total score from the Hands-On measure, the Job Knowledge Test, and the Situational Judgment Test.

1) ASVAB was represented by

a) The AFQT.

b) A regression-weighted composite of the four factors.

c) A regression-weighted composite of the nine subtests.

2) ABLE was represented by three alternative sets of scores.

a) The seven rational/theoretical scales developed for the Experimental Battery.

b) The seven empirical scales developed on the basis of a factor analysis that retained all the items (168 were used). This analysis is described in Chapter 2 of this report.

c) The seven empirical scales developed by using the results of the factor analysis to select the best items to reflect each factor; 114 items were retained. This analysis is also described in Chapter 2 of this report.

Both corrected (for multivariate restriction of range) and uncorrected estimates were computed, and both regression

weights and unit weights (applied to standardized scores) were used. When multiple regression weights were used, the Rozeboom correction (Rozeboom, 1978) was used to account for the fitting of error.

B) As in CVI, incremental validities for the ABLE composites over the ASVAB composites were also computed against each criterion score.

C) A hierarchical regression analysis, stopping at six predictors, was run against each performance factor, factor composite, and individual criterion score (i.e., HO, JK, and SJT). Only the four ASVAB factors and the seven empirical ABLE factors based on 114 items were used as predictors. For reasons that will be explained, this combination seemed to be the best set of scores; consequently, there are a total of 11 predictors. The step-wise procedure was stopped at six because virtually no additional information was obtained after that point. Solutions were computed for both the corrected and uncorrected covariances. The final multiple correlation was adjusted using the Rozeboom correction.

D) A hierarchical regression analysis was also carried out on selected criterion variables for the combined samples from three MOS clusters. The clusters were based on the results of an MOS clustering within the Synthetic Validation Project (Wise et al., 1991) and on the results of the validity generalization analysis for the Batch A MOS in the CVI sample (Wise, McHenry, & Campbell, 1990). The three clusters are:

Cluster One:	Combat specialties (MOS 11B, 13B, 19E, 95B/N = 218)
Cluster Two:	Technical specialties (MOS 31C, 63B/N = 96)
Cluster Three:	Support specialties (MOS 71L, 91A/N = 111)

MOS 88M was not included because its cluster membership was less clear. The objective here was to maximize a priori the opportunity for detecting differential validity within what is essentially a field test sample. The cluster memberships are not cast in stone.

E) The final step consisted of using the optimal six variable equations from the hierarchical regression analyses described above to develop a picture of the degree of differential prediction across performance factors and across the three MOS clusters.

1) To examine differential prediction across performance factors and factor composites on the combined sample, a square matrix of multiple correlations was generated by applying the regression equation developed for a specific criterion variable to every other criterion variable. The diagonal was adjusted using the Rozeboom correction.

2) To examine differential prediction across the three MOS clusters, a 3 x 3 matrix of correlations was generated for each of the six performance factors and four factor composites. For each matrix, the equation developed for a specific MOS cluster was applied to the data from each of the other two. The diagonal was adjusted using the Rozeboom correction.

RESULTS

For reference purposes, the full list of predictor and criterion variables and their designators is given in Table 8.2. The intercorrelations of the 19 criterion scores, based on the combined sample, are given in Table 8.3.

Table 8.2

Variable Names for ASVAB Factors, ABLE-114 Factors, and 19 Criterion Variables

Variable	Label
Predictors	
A1ATECH	ASVAB Factor Composite: Technical
A1AQUANT	ASVAB Factor Composite: Quantitative
A1AVERBL	ASVAB Factor Composite: Verbal
A1ASPEED	ASVAB Factor Composite: Speed
B8FSCNT2	ABLE Factor Score: Locus of Control (114 items)
B8FSCOP2	ABLE Factor Score: Cooperation (114 items)
B8FSDMN2	ABLE Factor Score: Dominance (114 items)
B8FSDPN2	ABLE Factor Score: Dependability (114 items)
B8FSPCD2	ABLE Factor Score: Physical Condition (114 items)
B8FSSTB2	ABLE Factor Score: Stress Tolerance (114 items)
B8FSWRK2	ABLE Factor Score: Work Orientation (114 items)
Criteria	
M8RAWCTP	Core Techical Proficiency, CVII Raw Construct (STD)
M8RAWGSP	General Soldier Proficiency, CVII Raw Construct (STD)
M8RAWELS	Effort/Leadership, CVII Raw Construct (STD)
ELSNOSJT	Effort/Leadership, Situational Judgment Test (SJT) removed (STD)
M8RAWMPD	Personal Discipline, CVII Raw Construct (STD)
M8RAWPFB	Physical Fitness, CVII Raw Construct (STD)
M8RAW[illegible]S	Train/Counsel, CVII Raw Construct (STD)
M8RESCTP	Core Technical Proficiency, CVII Residual Score (STD)
M8RESGSP	General Soldier Proficiency, CVII Residual Score (STD)
M8RESELS	Effort/Leadership, CVII Residual Score (STD)

(Continued)

M8RESMPD Personal Discipline, CVII Residual Score (STD)
M8RESPFB Physical Fitness, CVII Residual Score (STD)
M8CTPGSP Criterion Composite: CTP (Raw) + GSP (Raw) (STD)
M8ELSMPD Criterion Composite: ELS (Raw) + MPD (Raw) (STD)
CRITCGT1 Criterion Factor 1: CTP+GSP+TCS
CRITEMP2 Criterion Factor 2: ELS+MPD+PFB
M8XHTOTT Hands-On Average Percent GO for All Tasks (STD)
M8XKTOTT Job Knowledge Total Percent Correct Score (STD)
M8XSTOT Situational Judgment Test Most - Least (STD)

Table 8.3

Intercorrelations of 19 Criterion Scores Based on the Combined CVII Sample

	M8RAWCTP	M8RAWGSP	M8RAWELS	M8RAWMPD	M8RAWPFB	M8RAWTCS	M8RESCTP	M8RESGSP	M8RESELS	M8RESMPD
M8RAWCTP	1.00	.54	.39	.16	-.01	.24	.91	.39	.27	.16
M8RAWGSP	.54	1.00	.43	.11	-.05	.26	.36	.90	.30	.12
M8RAWELS	.39	.43	1.00	.45	.29	.26	.26	.29	.85	.26
M8RAWMPD	.16	.11	.45	1.00	.35	.07	.16	.10	.25	.84
M8RAWPFB	-.01	-.05	.29	.35	1.00	.02	.02	-.03	.18	.17
M8RAWTCS	.24	.26	.26	.07	.02	1.00	.25	.28	.31	.10
M8RESCTP	.91	.36	.26	.16	.02	.25	1.00	.38	.25	.13
M8RESGSP	.39	.90	.29	.10	-.03	.28	.38	1.00	.28	.08
M8RESELS	.27	.30	.85	.25	.18	.31	.25	.28	1.00	.29
M8RESMPD	.16	.12	.26	.84	.17	.10	.13	.08	.29	1.00
M8RESPFB	-.02	-.06	.14	.15	.91	.03	-.02	-.06	.19	.19
ELSNOSJT	.31	.29	.88	.51	.40	.22	.32	.30	.76	.24
M8CTPGSP	.87	.88	.47	.15	-.03	.29	.72	.74	.33	.16
M8ELSMPD	.33	.32	.86	.84	.38	.20	.25	.24	.66	.63
CRITCGT1	.80	.81	.48	.15	-.01	.65	.68	.70	.39	.17
CRITEMP2	.24	.22	.78	.78	.72	.16	.19	.17	.57	.55
M8XHTOTT	.65	.66	.31	.11	.01	.22	.69	.72	.33	.11
M8XKTOTT	.73	.80	.48	.14	-.07	.27	.45	.53	.24	.14
M8XSTOT	.34	.42	.71	.14	.00	.20	.05	.14	.58	.16

	M8RESPFB	ELSNOSJT	M8CTPGSP	M8ELSMPD	CRITCGT1	CRITEMP2	M8XHTOTT	M8XKTOTT	M8XSTOT
M8RAWCTP	-.02	.31	.87	.33	.80	.24	.65	.73	.34
M8RAWGSP	-.06	.29	.88	.32	.81	.22	.66	.80	.42
M8RAWELS	.14	.88	.47	.86	.48	.78	.31	.48	.71
M8RAWMPD	.15	.51	.15	.84	.15	.78	.11	.14	.14
M8RAWPFB	.91	.40	-.03	.38	-.01	.72	.01	-.07	.00
M8RAWTCS	.03	.22	.29	.20	.65	.16	.22	.27	.20
M8RESCTP	-.02	.32	.72	.25	.68	.19	.69	.45	.05
M8RESGSP	-.06	.30	.74	.24	.70	.17	.27	.53	.14
M8RESELS	.19	.76	.33	.66	.39	.57	.33	.24	.58
M8RESMPD	.19	.24	.16	.63	.17	.55	.11	.14	.16
M8RESPFB	1.00	.19	-.05	.17	-.02	.53	.00	-.10	-.01
ELSNOSJT	.19	1.00	.34	.83	.37	.79	.26	.32	.29
M8CTPGSP	-.05	.34	1.00	.37	.92	.27	.74	.88	.43
M8ELSMPD	.17	.83	.37	1.00	.38	.91	.25	.37	.51
CRITCGT1	-.02	.37	.92	.38	1.00	.28	.68	.81	.43
CRITEMP2	.53	.79	.27	.91	.28	1.00	.19	.25	.38
M8XHTOTT	.00	.26	.74	.25	.68	.19	1.00	.44	.23
M8XKTOTT	-.10	.32	.88	.37	.81	.25	.44	1.00	.49
M8XSTOT	-.01	.29	.43	.51	.43	.38	.23	.49	1.00

Note. Corrected for range restriction. See Table 8.2 for variable names.

Basic Validities

The basic multiple correlations for ASVAB (4 factors vs. 9 subtests) and ABLE (7 theoretically based composites vs. 7 "purified" empirical factors) are given in Tables 8.4 and 8.5. The combined sample for Table 8.5 is smaller because less than half the sample took the ABLE during the CVII data collection.

Several things are worth noting. ASVAB, taken at time of entry, is still a highly valid predictor of Core Technical and General Soldiering Proficiency and has respectable validity for Effort/Leadership. For ASVAB, the four factors and the nine subtests provide virtually the same level of predictive accuracy. However, for ABLE the reduced factor scores (114 items) are consistently the best predictor set. ABLE predicts Effort/Leadership and Physical Fitness very well and has reasonable correlations with General Soldiering and Training/Counseling. Personal Discipline is not well predicted by anything, which is consistent with the previous discussion.

Table 8.4

Multiple Correlations for 4 ASVAB Factors, 9 ASVAB Subtests, and AFQT Against 19 Criterion Variables

Variable		N	ASVAB Factors	ASVAB Subtests	AFQT
M8RAWCTP	Core Technical	851	.44	.43	.40
M8RAWGSP	General Soldiering	737	.54	.56	.49
M8RAWELS	Effort/Leadership	851	.39	.38	.37
M8RAWMPD	Personal Discipline	851	.00	.00	.01
M8RAWPFB	Physical Fitness	851	.17	.16	.17
M8RAWTCS	Training/Counseling	851	.19	.17	.21
M8RESCTP	Core Technical	851	.26	.25	.23
M8RESGSP	General Soldiering	737	.38	.40	.33
M8RESELS	Effort/Leadership	851	.25	24	.23
M8RESMPD	Personal Discipline	851	.00	.00	.00
M8RESPFB	Physical Fitness	851	.21	.21	.21
ELSNOSJT	ELS - No SJT	851	.22	.21	.20
M8CTPGSP	Crit Comp CTP/GSP	737	.55	.56	.50
M8ELSMPD	Crit Comp ELS/MPD	851	.27	.26	.25
CRITCGT1	Crit 1 CTP+GSP+TCS	737	.53	.53	.49
CRITEMP2	Crit 2 ELS+MPD+PFB	851	.13	.10	.11
M8XHTOTT	Hands-On Average	851	.31	.32	.29
M8XKTOTT	Job Knowledge Total	851	.61	.62	.56
M8XSTOT	Situation Judgment	851	.45	.44	.44

Note. Adjusted (Rozeboom formula) and corrected for range restriction.

Unit Weights

The validity coefficients obtained by using unit weights are also shown in Table 8.5. In general, after adjustments, regression weights and unit weights for ASVAB yield about the same level of validity. However, regression weights are somewhat better than unit weights for the seven empirical ABLE factors. There is not as much positive manifold among the ABLE factors as there is among the ASVAB subtests.

Table 8.5

Multiple Correlations for 4 ASVAB Factors, 9 ASVAB Subtests, 7 ABLE Composites, and 7 ABLE-114 Scores Against 19 Criterion Variables (All MOS), With Unit Weights

Variable		ASVAB Factors	ASVAB Subtests	ABLE Composites	ABLE-114
M8RAWCTP	Core Technical	43 (42)	43 (43)	15 (14)	20 (15)
M8RAWGSP	General Soldiering	56 (54)	57 (55)	22 (16)	26 (18)
M8RAWELS	Effort/Leadership	38 (38)	39 (38)	37 (32)	41 (32)
M8RAWMPD	Personal Discipline	00 (11)	00 (11)	20 (21)	18 (22)
M8RAWPFB	Physical Fitness	13 (16)	06 (16)	32 (23)	34 (21)
M8RAWTCS	Training/Counseling	06 (13)	00 (12)	27 (19)	23 (18)
M8RESCTP	Core Technical	29 (29)	28 (30)	00 (12)	07 (13)
M8RESGSP	General Soldiering	42 (42)	43 (42)	14 (15)	18 (16)
M8RESELS	Effort/Leadership	25 (26)	27 (25)	38 (31)	41 (30)
M8RESMPD	Personal Discipline	00 (09)	00 (09)	16 (20)	15 (19)
M8RESPFB	Physical Fitness	16 (20)	09 (20)	34 (21)	35 (18)
ELSNOSJT	ELS - No SJT	24 (22)	23 (22)	34 (31)	38 (30)
M8CTPGSP	Crit Comp CTP/GSP	57 (55)	58 (56)	22 (17)	27 (19)
M8ELSMPD	Crit Comp ELS/MPD	29 (30)	29 (29)	34 (32)	37 (32)
CRITCGT1	Crit 1 CTP+GSP+TCS	50 (50)	50 (50)	29 (22)	32 (23)
CRITEMP2	Crit 2 ELS+MPD+PFB	14 (16)	12 (15)	34 (35)	35 (34)
M8XHTOTT	Hands-On Average	39 (40)	38 (40)	12 (12)	18 (13)
M8XKTOTT	Job Knowledge Total	59 (56)	59 (57)	25 (14)	28 (16)
M8XSTOT	Situation Judgment	42 (43)	42 (43)	27 (20)	31 (21)

Note. N = 412. Adjusted (Rozeboom formula). Validities of unit-weighted composites are in parentheses. Decimals omitted.

Incremental Validities

Table 8.6 contains the same type of CVII incremental analyses that was done in CVI (Campbell & Zook, 1991). ABLE does not add to the prediction of Core Technical and General Soldiering Proficiency, but it adds about the same amount to the prediction of Effort/Leadership as it did in CVI. However, the overall level of prediction for ELS is higher in CVII than it was in CVI (i.e., .50 vs. .43).

Table 8.6

Multiple Correlations for 4 ASVAB Factors + 7 ABLE Composites and + 7 ABLE-114 Scores, and for 9 ASVAB Subtests + 7 ABLE Composites and + 7 ABLE-114 Scores Against 19 Criterion Variables, All MOS

Variable		ASVAB Factors + ABLE Comp (K=11)	ASVAB Factors + ABLE-114 (K=11)	ASVAB Subtests + ABLE Comp (K=16)	ASVAB Subtests + ABLE-114 (K=16)
M8RAWCTP	Core Technical	.42	.43	.42	.43
M8RAWGSP	General Soldiering	.56	.57	.58	.58
M8RAWELS	Effort/Leadership	.49	.49	.49	.50
M8RAWMPD	Personal Discipline	.16	.13	.09	.03
M8RAWPFB	Physical Fitness	.34	.35	.32	.33
M8RAWTCS	Training/Counseling	.26	.20	.24	.17
M8RESCTP	Core Technical	.24	.26	.24	.25
M8RESGSP	General Soldiering	.42	.42	.44	.44
M8RESELS	Effort/Leadership	.43	.43	.43	.43
M8RESMPD	Personal Discipline	.09	.07	.00	.00
M8RESPFB	Physical Fitness	.36	.37	.34	.34
ELSNOSJT	ELS - No SJT	.39	.41	.38	.41
M8CTPGSP	Crit Comp CTP/GSP	.57	.57	.58	.58
M8ELSMPD	Crit Comp ELS/MPD	.40	.40	.40	.40
CRITCGT1	Crit 1: CTP+GSP+TCS	.54	.54	.54	.54
CRITEMP2	Crit 2: ELS+MPD+PFB	.35	.35	.34	.34
M8XHTOTT	Hands-On Average	.37	.37	.37	.37
M8XKTOTT	Job Knowledge Total	.60	.60	.60	.60
M8XSTOT	Situation Judgment	.45	.44	.45	.44

Note. N = 412. Adjusted (Rozeboom formula) and corrected for range restriction.

Hierarchical Analyses

The hierarchical analyses on the combined sample for selected criterion measures are shown in Tables 8.7 - 8.18. The difference between these analyses and the incremental validities presented earlier is that all 11 variables were used in the incremental evaluation and the procedure was not stepwise. The hierarchical procedure asked for the optimal 6-variable equation.

One result of note is that for any specific criterion measure the first four variables are never all from ASVAB or all from ABLE. Another general question that might be asked is whether the optimal 6-variable equation provides better prediction than using all 11 variables each time. It appears that it does not for CTP and GSP, but does provide a consistent differential of .04 - .06 for ELS, MPD, and PFB. It also appears that ABLE, most frequently the Dependability scale, does play a role in predicting CTP and GSP. This contribution is masked when the non-hierarchical procedure is used.

Table 8.7

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against Core Technical Proficiency (M8RAWCTP): Optimal Batteries and Weights for 1-6 Predictors, All MOS

Number in Model	R-Square	R	Variables in Model
1	.190	.436	A1ATECH
2	.207	.455	A1ATECH B8FSDPN2
3	.218	.467	A1ATECH B8FSDPN2 A1AQUANT
4	.223	.472	A1ATECH B8FSDPN2 A1AQUANT B8FSPCD2
5	.227	.476	A1ATECH B8FSDPN2 A1AQUANT B8FSPCD2 B8FSWRK2
6	.227	.476	A1ATECH B8FSDPN2 A1AQUANT B8FSPCD2 B8FSWRK2 B8FSCNT2

Adjusted R, 6 Predictors .455
Adjusted R, 11 Predictors .436

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSDMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCD2
1	.436	.	.	.	.	.	.	.	.	.	.
2	.428	.	.	.	.	.	.132	.	.	.	.
3	.339	.139	.	.	.	.	.112	.	.	.	.
4	.339	.131	.	.	.	.	.116	.	.	.	-.070
5	.334	.122	.	.	.074	.	.093		.	.	-.087
6	.334	.124	.	.	.063	.	.039	.	.	.023	-.085

Note. N = 477. Unadjusted and corrected for range restriction. See Table 8.2 for names of variables. Raw construct.

Table 8.8

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against General Soldiering Proficiency (M8RAWGSP): Optimal Batteries and Weights for 1-6 Predictors, All MOS

Number in Model	R-Square	R	Variables in Model
1	.286	.535	A1ATECH
2	.320	.566	A1ATECH A1AQUANT
3	.331	.575	A1ATECH A1AQUANT B8FSDPN2
4	.341	.584	A1ATECH A1AQUANT B8FSDMN2 B8FSPCD2
5	.349	.591	A1ATECH A1AQUANT B8FSDPN2 B8FSDMN2 B8FSPCD2
6	.351	.592	A1ATECH A1AQUANT B8FSDPN2 B8FSDMN2 B8FSPCD2 B8FSCNT2
Adjusted R, 6 Predictors		.576	
Adjusted R, 11 Predictors		.562	

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSDMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCD2
1	.535	.	.	.	.	.	.	.	.	.	.
2	.376	.243	.	.	.	.	.	.	.	.	.
3	.387	.213	.	.	.	.	.107	.	.	.	.
4	.385	.195	.	.	.	.142	.	.	.	.	-.111
5	.395	.170	.	.	.	.131	.097	.	.	.	-.112
6	.393	.175	.	.	.	.122	.082	.	.	.047	-.110

Note. N = 413. Unadjusted and corrected for range restriction. Raw construct.

Table 8.9

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against Effort/Leadership (M8RAWELS): Optimal Batteries and Weights for 1-6 Predictors, All MOS

Number in Model	R-Square	R	Variables in Model
1	.144	.379	A1AQUANT
2	.226	.475	A1AQUANT B8FSDMN2
3	.240	.490	A1AQUANT B8FSDMN2 B8FSWRK2
4	.243	.493	A1AQUANT B8FSDMN2 B8FSWRK2 B8FSDPN2
5	.246	.496	A1AQUANT B8FSDMN2 B8FSWRK2 B8FSDPN2 A1ATECH
6	.248	.498	A1AQUANT B8FSDMN2 B8FSWRK2 B8FSDPN2 A1ATECH B8FSPCD2

Adjusted R, 6 Predictors	.478
Adjusted R, 11 Predictors	.461

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSDMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCD2
1	.	.380	.	.	.	.	.	.	.	.	.
2	.	.329	.	.	.	.290	.	.	.	.	.
3	.	.315	.	.	.151	.202	.	.	.	.	.
4	.	.308	.	.	.129	.206	.059	.	.	.	.
5	.075	.258	.	.	.122	.212	.065	.	.	.	.
6	.075	.249	.	.	.126	.226	.064	.	.	.	-.048

Note. N = 477. Unadjusted and corrected for range restriction. Raw construct.

Table 8.10

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against Effort/Leadership Without SJT (ELSNOSJT): Optimal Batteries and Weights for 1-6 Predictors, All MOS

Number in Model	R-Square	R	Variables in Model
1	.117	.342	B8FSDMN2
2	.153	.391	B8FSDMN2 A1AQUANT
3	.170	.412	B8FSDMN2 A1AQUANT B8FSWRK2
4	.173	.416	B8FSDMN2 A1AQUANT B8FSWRK2 A1AVERBL
5	.174	.417	B8FSDMN2 A1AQUANT B8FSWRK2 A1AVERBL A1ATECH
6	.176	.420	B8FSDMN2 A1AQUANT B8FSWRK2 A1AVERBL B8FSSTB2 B8FSCNT2

Adjusted R, 6 Predictors .394
Adjusted R, 11 Predictors .370

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSDMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCD2
1	.	.	.	.	.	.343	.	.	.	.	.
2	.	.193	.	.	.	.309	.	.	.	.	.
3	.	.177	.	.	.162	.214	.	.	.	.	.
4	.	.250	-.094	.	.164	.216	.	.	.	.	.
5	.050	.239	-.122	.	.162	.220	.	.	.	.	.
6	.	.251	-.088	.	.152	.229	.	-.046	.	.045	.

Note. N = 477. Unadjusted and corrected for range restriction. SJT = Situational Judgment Test. Raw construct.

Table 8.11

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against Personal Discipline (M8RAWMPD): Optimal Batteries and Weights for 1-6 Predictors, All MOS

Number in Model	R-Square	R	Variables in Model
1	.038	.195	B8FSWRK2
2	.055	.235	B8FSWRK2 B8FSDPN2
3	.064	.253	B8FSWRK2 B8FSCOP2 A1ASPEED
4	.069	.263	B8FSWRK2 B8FSDPN2 B8FSCOP2 A1AQUANT
5	.071	.266	B8FSWRK2 B8FSDPN2 B8FSCOP2 A1AQUANT B8FSDMN2
6	.073	.270	B8FSWRK2 B8FSDPN2 B8FSCOP2 A1AQUANT B8FSDMN2 A1ATECH

Adjusted R, 6 Predictors	.222
Adjusted R, 11 Predictors	.171

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSDMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCD2
1	.	.	.	.	.196	.	.	.	.	.	.
2	.	.	.	.	.147	.	.139	.	.	.	.
3	.	.	.	.104	.129	.	.	.	.120	.	.
4	.	.085	.	.	.108	.	.096	.	.096	.	.
5	.	.081	.	.	.072	.059	.098	.	.097	.	.
6	-.051	.115	.	.	.076	.054	.093	.	.100	.	.

Note. N = 477. Unadjusted and corrected for range restriction. Raw construct.

Table 8.12

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against Physical Fitness (M8RAWPFB): Optimal Batteries and Weights for 1-6 Predictors, All MOS

Number in Model	R-Square	R	Variables in Model
1	.109	.330	B8FSPCD2
2	.123	.351	B8FSPCD2 A1ATECH
3	.136	.369	B8FSPCD2 A1ATECH B8FSWRK2
4	.139	.373	B8FSPCD2 A1ATECH B8FSWRK2 B8FSDMN2
5	.142	.377	B8FSPCD2 A1ATECH B8FSWRK2 A1ASPEED A1AQUANT
6	.145	.381	B8FSPCD2 A1ATECH B8FSWRK2 B8FSDMN2 A1ASPEED A1AQUANT

Adjusted R, 6 Predictors	.351
Adjusted R, 11 Predictors	.323

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSDMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCD2
1	.	.	.	.	.	.	.	.	.	.	.351
2	-.118	.	.	.	.	.	.	.	.	.	.322
3	-.137	.	.	.	.119	.	.	.	.	.	.293
4	-.138	.	.	.	.084	.064	.	.	.	.	.281
5	-.163	.094	.	-.095	.124	.	.	.	.	.	.290
6	-.158	.086	.	-.097	.090	.064	.	.	.	.	.277

Note. N = 477. Unadjusted and corrected for range restriction. Raw construct.

Table 8.13

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against Training/Counseling (M8RAWTCS): Optimal Batteries and Weights for 1-6 Predictors, All MOS

Number in Model	R-Square	R	Variables in Model
1	.041	.202	B8FSDMN2
2	.056	.237	B8FSDMN2 B8FSCNT2
3	.070	.265	B8FSDMN2 B8FSCNT2 A1AQUANT
4	.074	.272	B8FSDMN2 B8FSCNT2 A1AQUANT B8FSDPN2
5	.080	.283	B8FSDMN2 B8FSCNT2 A1AQUANT B8FSDPN2 B8FSCOP2
6	.083	.288	B8FSDMN2 B8FSCNT2 A1AQUANT B8FSDPN2 B8FSCOP2 B8FSPCD2

Adjusted R, 6 Predictors	.244
Adjusted R, 11 Predictors	.199

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSDMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCD2
1	.	.	.	.	.	.202	.	.	.	.	.
2	.	.	.	.	.	.174	.	.	.	.128	.
3	.	.119	.	.	.	.152	.	.	.	.130	.
4	.	.108	.	.	.	.147	.067	.	.	.110	.
5	.	.112	.	.	.	.156	.099	.	-.086	.121	.
6	.	.101	.	.	.	.177	.099	.	-.081	.117	-.062

Note. N = 477. Unadjusted and corrected for range restriction. Raw construct.

Table 8.14

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against Core Technical/General Soldiering Composite (M8CTPGSP): Optimal Batteries and Weights for 1-6 Predictors, All MOS

Number in Model	R-Square	R	Variables in Model
1	.275	.524	A1ATECH
2	.301	.549	A1ATECH A1AQUANT
3	.317	.563	A1ATECH A1AQUANT B8FSDPN2
4	.323	.568	A1ATECH A1AQUANT B8FSDPN2 B8FSCNT2
5	.329	.574	A1ATECH A1AQUANT B8FSDPN2 B8FSCNT2 B8FSPCD2
6	.332	.576	A1ATECH A1AQUANT B8FSDPN2 B8FSCNT2 B8FSPCD2 B8FSDMN2

Adjusted R, 6 Predictors	.222
Adjusted R, 11 Predictors	.171

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSDMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCD2
1	.524	.	.	.	.	.	.	.	.	.	.
2	.383	.216	.	.	.	.	.	.	.	.	.
3	.396	.182	.	.	.	.	.128	.	.	.	.
4	.393	.187	.	.	.	.	.099	.	.	.083	.
5	.393	.178	.	.	.	.	.103	.	.	.085	-.075
6	.392	.163	.	.	.	.064	.100	.	.	.075	-.098

Note. N = 445. Unadjusted and corrected for range restriction.

Table 8.15

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against Effort-Leadership/Discipline Composite (M8ELSMPD): Optimal Batteries and Weights for 1-6 Predictors, All MOS

Number in Model	R-Square	R	Variables in Model
1	.094	.307	B8FSWRK2
2	.142	.377	B8FSWRK2 A1AQUANT
3	.151	.389	B8FSWRK2 A1AQUANT B8FSDMN2
4	.159	.399	B8FSWRK2 A1AQUANT B8FSDMN2 B8FSDPN2
5	.160	.400	B8FSWRK2 A1AQUANT B8FSDMN2 B8FSDPN2 A1ASPEED
6	.161	.401	B8FSWRK2 A1AQUANT B8FSDMN2 B8FSDPN2 A1ASPEED B8FSCOP2

Adjusted R, 6 Predictors .375
Adjusted R, 11 Predictors .352

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSDMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCD2
1	.	.	.	.	.306	.	.	.	.	.	.
2	.	.224	.	.	.260	.	.	.	.	.	.
3	.	.213	.	.	.188	.123	.	.	.	.	.
4	.	.203	.	.	.153	.129	.093	.	.	.	.
5	.	.170	.	.055	.154	.128	.083	.	.	.	.
6	.	.171	.	.052	.143	.129	.070	.	.039	.	.

Note. N = 509. Unadjusted and corrected for range restriction.

Table 8.16

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against Criterion Factor 1[a] (CRITCGT1): Optimal Batteries and Weights for 1-6 Predictors, All MOS

Number in Model	R-Square	R	Variables in Model
1	.229	.479	A1ATECH
2	.267	.517	A1ATECH B8FSDPN2
3	.289	.538	A1ATECH B8FSDPN2 A1AQUANT
4	.306	.553	A1ATECH B8FSDPN2 B8FSDMN2 B8FSPCD2
5	.318	.564	A1ATECH B8FSDPN2 A1AQUANT B8FSDMN2 B8FSPCD2
6	.323	.568	A1ATECH B8FSDPN2 A1AQUANT B8FSDMN2 B8FSPCD2 B8FSCNT2

Adjusted R, 6 Predictors	.550	
Adjusted R, 11 Predictors	.535	

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSDMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCD2
1	.478	.	.	.	.	.	.	.	.	.	.
2	.462	.	.	.	.	.	.195	.	.	.	.
3	.331	.205	.	.	.	.	.161	.	.	.	.
4	.435	.	.	.	.	.194	.169	.	.	.	-.145
5	.341	.152	.	.	.	.170	.147	.	.	.	-.125
6	.338	.161	.	.	.	.155	.122	.	.	.078	-.122

Note. N = 413. Unadjusted and corrected for range restriction.
[a] Core Technical + General Soldiering + Training/Counseling.

Table 8.17

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against Criterion Factor 2[a] (CRITEMP2): Optimal Batteries and Weights for 1-6 Predictors, All MOS

Number in Model	R-Square	R	Variables in Model
1	.096	.310	B8FSWRK2
2	.120	.346	B8FSWRK2 B8FSDMN2
3	.136	.369	B8FSWRK2 B8FSDMN2 A1AQUANT
4	.148	.385	B8FSWRK2 B8FSDMN2 A1AQUANT B8FSPCD2
5	.155	.394	B8FSWRK2 B8FSDMN2 A1AQUANT B8FSPCD2 B8FSDPN2
6	.157	.396	B8FSWRK2 B8FSDMN2 A1AQUANT B8FSPCD2 B8FSDPN2 A1AVERBL

Adjusted R, 6 Predictors	.368
Adjusted R, 11 Predictors	.342

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSDMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCD2
1	.	.	.	.	.310	.	.	.	.	.	.
2	.	.	.	.	.195	.192	.	.	.	.	.
3	.	.130	.	.	.177	.180	.	.	.	.	.
4	.	.150	.	.	.166	.146	.	.	.	.	.116
5	.	.139	.	.	.131	.152	.093	.	.	.	.117
6	.	.189	-.066	.	.131	.156	.098	.	.	.	.111

Note. N = 477. Unadjusted and corrected for range restriction.
[a] Effort/Leadership + Personal Discipline + Physical Fitness.

Table 8.18

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against Hands-On Average (M8XHTOTT): Optimal Batteries and Weights f-r 1-6 Predictors, All MOS

Number in Model	R-Square	R	Variables in Model
1	.122	.349	A1AVERBL
2	.139	.373	A1AQUANT A1ATECH
3	.144	.379	A1AVERBL A1ATECH A1AQUANT
4	.149	.386	A1AQUANT A1ATECH B8FSDMN2 B8FSPCD2
5	.152	.390	A1AVERBL A1ATECH A1AQUANT B8FSDMN2 B8FSPCD2
6	.152	.390	A1AVERBL A1ATECH A1AQUANT B8FSDMN2 B8FSPCD2 B8FSDPN2

Adjusted R, 6 Predictors	.361
Adjusted R, 11 Predictors	.335

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSDMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCD2
1	.	.	.350	.	.	.	.	.	.	.	.
2	.205	.205	.	.	.	.	.	.	.	.	.
3	.155	.135	.131	.	.	.	.	.	.	.	.
4	.210	.177	.	.	.	.090	.	.	.	.	-.086
5	.170	.125	.103	.	.	.082	.	.	.	.	-.077
6	.175	.123	.097	.	.	.079	.022	.	.	.	-.078

Note. N = 477. Unadjusted and corrected for range restriction.

A summary description of the six best predictors in hierarchical order for each of eight criterion variables is given in Table 8.19. Selecting predictors with the corrected versus uncorrected covariance matrix makes virtually no difference in the predictor battery selected.

Generalizability

The hierarchical optimal battery analyses for selected criterion scores within the three MOS clusters are shown in Tables 8.20 - 8.37. Although a more formal test is still required, the content of the optimal equations does seem to be different across clusters for Core Technical Proficiency and perhaps also for General Soldiering Proficiency and Effort/Leadership, but not for Personal Discipline, Physical Fitness, and Training/Counseling.

A descriptive picture of the generalizability of prediction equations across performance factors (for the combined sample) and across MOS clusters for selected performance factors is shown in Tables 8.38 - 8.39. All entries are multiple correlations and the diagonals represent estimates based on optimal weights. Estimates of what happens when less than optimal weights are used to predict that same criterion are obtained by looking across the rows. Estimates of what happens when a particular set of weights is applied to other criterion measures or other MOS are obtained by looking down the columns.

All estimates are based on the corrected covariance matrix. The diagonals are adjusted for shrinkage using the Rozeboom formula with k = 6. The off-diagonals are not adjusted because the weights were not computed against that particular dependent variable. The values in the diagonals of Tables 8.38 and 8.39 will vary slightly from the corresponding estimates in Tables 8.7 - 8.37 because all estimates in Tables 8.38 and 8.39 were based on exactly the same sample. The samples in Tables 8.7 - 8.37 varied slightly by criterion variable or by MOS group.

As shown in Table 8.38, within MOS clusters there is very little differential validity for CTP vs. GSP. Either set of weights works about as well. However, the same is not the case for the other four performance factors. Better prediction is always achieved by using the equation developed for each factor.

As portrayed in Table 8.39, the greatest degree of differential validity across MOS groups is for GSP and TCS, not CTP. However, the sample sizes for group 2 and group 3 are not large and firm conclusions will be dependent on an appropriate examination of sampling error, which is yet to be done.

A summary of the mean diagonal entries versus the mean off-diagonal entries in Tables 8.38 and 8.39 is shown in Tables 8.40 and 8.41. For example, Table 8.41 shows that if the weights for the optimal battery in one cluster are applied to those same variables in the other two clusters, the level of validity is much lower. The greatest difference in validity across MOS clusters is for GSP, while the smallest difference is for ELS.

Table 8.19

Best Six Predictors From ASVAB and ABLE for Eight Criterion Measures Multiple Correlations

Criterion		Adjusted R	Predictors In Order of Importance
Core Technical (M8RAWCTP)	Uncorrected	.335	A1ATECH B8FSDPN2 A1AQUANT B8FSPCD2 B8FSWRK2 B8FSCNT2
	Corrected	.455	A1ATECH B8FSDPN2 A1AQUANT B8FSPCD2 B8FSWRK2 B8FSCNT2
General Soldiering (M8RAWGSP)	Uncorrected	.436	A1ATECH A1AQUANT B8FSDPN2 B8FSDMN2 B8FSPCD2 B8FSCNT2
	Corrected	.576	A1ATECH A1AQUANT B8FSDPN2 B8FSDMN2 B8FSPCD2 B8FSCNT2
Effort/ Leadership (M8RAWELS)	Uncorrected	.390	B8FSDMN2 A1AQUANT B8FSWRK2 B8FSDPN2 A1ATECH B8FSPCD2
	Corrected	.478	A1AQUANT B8FSDMN2 B8FSWRK2 B8FSDPN2 A1ATECH B8FSPCD2
Personal Discipline (M8RAWMPD)	Uncorrected	.184	B8FSWRK2 B8FSCOP2 B8FSDPN2 A1AQUANT B8FSDMN2 A1ATECH
	Corrected	.222	B8FSWRK2 B8FSDPN2 B8FSCOP2 A1AQUANT B8FSDMN2 A1ATECH
Physical Fitness (M8RAWPFB)	Uncorrected	.335	B8FSPCD2 B8FSWRK2 A1ATECH B8FSDMN2 A1AQUANT A1ASPEED
	Corrected	.351	B8FSPCD2 A1ATECH B8FSWRK2 B8FSDMN2 A1ASPEED A1AQUANT
Training/ Counseling (M8RAWTCS)	Uncorrected	.225	B8FSDMN2 B8FSCNT2 A1AQUANT B8FSDPN2 B8FSCOP2 B8FSPCD2
	Corrected	.244	B8FSDMN2 B8FSCNT2 A1AQUANT B8FSDPN2 B8FSCOP2 B8FSPCD2
Criterion 1 (CRITCGT1)	Uncorrected	.425	A1ATECH B8FSDPN2 B8FSDMN2 B8FSPCD2 A1AQUANT B8FSCNT2
	Corrected	.550	A1ATECH B8FSDPN2 A1AQUANT B8FSDMN2 B8FSPCD2 B8FSCNT2
Criterion 2 (CRITEMP2)	Uncorrected	.315	B8FSWRK2 B8FSDMN2 A1AQUANT B8FSPCD2 B8FSDPN2 A1AVERBL
	Corrected	.368	B8FSWRK2 B8FSDMN2 A1AQUANT B8FSPCD2 B8FSDPN2 A1AVERBL

Note. Corrected and uncorrected for range restriction. Adjusted by the Rozeboom formula. See Table 8.2 for names of predictors.

Table 8.20

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against Core Technical Proficiency (M8RAWCTP): Optimal Batteries and Weights for 1-6 Predictors, Combat MOS[a]

Number in Model	R-Square	R	Variables in Model
1	.177	.421	A1ATECH
2	.193	.439	A1ATECH B8FSCNT2
3	.200	.447	A1ATECH B8FSCNT2 B8FSDMN2
4	.207	.455	A1ATECH B8FSCNT2 B8FSDMN2 B8FSPCD2
5	.210	.458	A1ATECH B8FSCNT2 B8FSDMN2 B8FSPCD2 A1AQUANT
6	.211	.459	A1ATECH B8FSCNT2 B8FSDMN2 B8FSPCD2 A1AQUANT B8FSCOP2

Adjusted R, 6 Predictors .437
Adjusted R, 11 Predictors .417

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSDMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCD2
1	.421	.	.	.	.	.	.	.	.	.	.
2	.432	.	.	.	.	.	.	.	.	.127	.
3	.431	.	.	.	.	.085	.	.	.	.110	.
4	.414	.	.	.	.	.110	.	.	.	.113	-.087
5	.366	.077	.	.	.	.095	.	.	.	.120	-.082
6	.373	.073	.	.	.	.099	.	.	-.036	.130	-.082

Note. N = 218. Unadjusted and corrected for range restriction.
[a] MOS Group 1 (11B, 13B, 19E, 95B).

Table 8.21

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against General Soldiering Proficiency (M8RAWGSP): Optimal Batteries and Weights for 1-6 Predictors, Combat MOS[a]

Number in Model	R-Square	R	Variables in Model
1	.321	.567	A1ATECH
2	.378	.615	A1ATECH B8FSDMN2
3	.406	.637	A1ATECH B8FSDMN2 A1AVERBL
4	.416	.645	A1ATECH B8FSDMN2 A1AVERBL B8FSDPN2
5	.427	.653	A1ATECH B8FSDMN2 A1AVERBL B8FSDPN2 B8FSPCD2
6	.432	.657	A1ATECH B8FSDMN2 A1AVERBL B8FSDPN2 B8FSPCD2 A1ASPEED

Adjusted R, 6 Predictors	.644
Adjusted R, 11 Predictors	.633

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSDMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCD2
1	.566	.	.	.	.	.	.	.	.	.	.
2	.564	.	.	.	.	.239	.	.	.	.	.
3	.383	.	.248	.	.	.211	.	.	.	.	.
4	.380	.	.231	.	.	.204	.104	.	.	.	.
5	.372	.	.202	.	.	.240	.110	.	.	.	-.114
6	.382	.	.139	.098	.	.219	.102	.	.	.	-.112

Note. N = 154. Unadjusted and corrected for range restriction.
[a] MOS Group 1 (11B, 13B, 19E, 95B).

Table 8.22

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against Effort/Leadership (M8RAWELS): Optimal Batteries and Weights for 1-6 Predictors, Combat MOS[a]

Number in Model	R-Square	R	Variables in Model
1	.162	.402	A1AQUANT
2	.235	.485	A1AQUANT B8FSDMN2
3	.246	.496	A1AQUANT B8FSDMN2 B8FSDPN2
4	.250	.500	A1AQUANT B8FSDMN2 B8FSDPN2 A1ATECH
5	.255	.505	A1AQUANT B8FSDMN2 B8FSDPN2 A1ATECH B8FSCOP2
6	.258	.508	A1AQUANT B8FSDMN2 B8FSDPN2 A1ATECH B8FSCOP2 B8FSCNT2

Adjusted R, 6 Predictors	.489
Adjusted R, 11 Predictors	.472

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSDMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCD2
1	.	.403	.	.	.	.	.	.	.	.	.
2	.	.360	.	.	.	.273	.	.	.	.	.
3	.	.352	.	.	.	.259	.106	.	.	.	.
4	.085	.295	.	.	.	.269	.102	.	.	.	.
5	.099	.282	.	.	.	.279	.124	.	-.075	.	.
6	.102	.292	.	.	.	.269	.107	.	-.088	.069	.

Note. N = 218. Unadjusted and corrected for range restriction.
[a] MOS Group 1 (11B, 13B, 19E, 95B).

Table 8.23

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against Personal Discipline (M8RAWMPD): Optimal Batteries and Weights for 1-6 Predictors, Combat MOS[a]

Number in Model	R-Square	R	Variables in Model
1	.058	.241	A1AQUANT
2	.105	.324	A1AQUANT B8FSDPN2
3	.122	.349	A1AQUANT B8FSDPN2 B8FSSTB2
4	.128	.358	A1AQUANT B8FSDPN2 B8FSSTB2 B8FSWRK2
5	.133	.365	A1AQUANT B8FSDPN2 B8FSSTB2 B8FSWRK2 A1ATECH
6	.139	.373	A1AQUANT B8FSDPN2 B8FSSTB2 B8FSWRK2 A1ATECH A1AVERBL

Adjusted R, 6 Predictors	.342
Adjusted R, 11 Predictors	.314

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSDMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCD2
1	.	.242	.	.	.	.	.	.	.	.	.
2	.	.220	.	.	.	.	.216	.	.	.	.
3	.	.236	.	.	.	.	.171	.139	.	.	.
4	.	.229	.	.	.090	.	.156	.100	.	.	.
5	-.096	.291	.	.	.094	.	.159	.099	.	.	.
6	-.148	.220	.135	.	.101	.	.149	.100	.	.	.

Note. N = 218. Unadjusted and corrected for range restriction.
[a] MOS Group 1 (11B, 13B, 19E, 95B).

Table 8.24

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against Physical Fitness (M8RAWPFB): Optimal Batteries and Weights for 1-6 Predictors, Combat MOS[a]

Number in Model	R-Square	R	Variables in Model
1	.084	.290	B8FSPCD2
2	.114	.338	B8FSPCD2 B8FSDPN2
3	.126	.355	B8FSPCD2 B8FSDPN2 B8FSCOP2
4	.136	.369	B8FSPCD2 B8FSDPN2 B8FSCOP2 B8FSWRK2
5	.138	.371	B8FSPCD2 B8FSDPN2 B8FSCOP2 B8FSWRK2 A1ATECH
6	.139	.373	B8FSPCD2 B8FSDPN2 B8FSCOP2 B8FSWRK2 A1ATECH B8FSSTB2

Adjusted R, 6 Predictors .342
Adjusted R, 11 Predictors .314

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSDMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCD2
1	.	.	.	.	.	.	.	.	.	.	.289
2	.	.	.	.	.	.	.175	.	.	.	.278
3	.	.	.	.	.	.	.213	.	-.117	.	.283
4	.	.	.	.	.111	.	.190	.	-.150	.	.260
5	-.050	.	.	.	.115	.	.194	.	-.147	.	.248
6	-.054	.	.	.	.131	.	.200	-.045	-.138	.	.250

Note. N = 218. Unadjusted and corrected for range restriction.
[a] MOS Group 1 (11B, 13B, 19E, 95B).

Table 8.25

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against Training/Counseling (M8RAWTCS): Optimal Batteries and Weights for 1-6 Predictors, Combat MOS[a]

Number in Model	R-Square	R	Variables in Model
1	.073	.270	A1AQUANT
2	.120	.346	A1AQUANT B8FSDMN2
3	.135	.367	A1AQUANT B8FSDMN2 B8FSCNT2
4	.147	.383	A1AQUANT B8FSDMN2 B8FSDPN2 A1ASPEED
5	.153	.391	A1AQUANT B8FSDMN2 B8FSDPN2 A1ASPEED B8FSSTB2
6	.163	.404	A1AQUANT B8FSDMN2 B8FSCNT2 B8FSSTB2 B8FSDPN2 A1ASPEED

Adjusted R, 6 Predictors .376
Adjusted R, 11 Predictors .351

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSDMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCD2
1	.	.270	.	.	.	.	.	.	.	.	.
2	.	.236	.	.	.	.220	.	.	.	.	.
3	.	.255	.	.	.	.193	.	.	.	.125	.
4	.	.321	.	-.156	.	.223	.141	.	.	.	.
5	.	.313	.	-.166	.	.250	.167	-.085	.	.	.
6	.	.314	.	-.143	.	.239	.138	-.130	.	.121	.

Note. N = 218. Unadjusted and corrected for range restriction.
[a] MOS Group 1 (11B, 13B, 19E, 95B).

Table 8.26

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against Core Technical Proficiency (N8RAWCTP): Optimal Batteries and Weights for 1-6 Predictors, Technical MOS[a]

Number in Model	R-Square	R	Variables in Model
1	.286	.535	A1ATECH
2	.313	.559	A1ATECH B8FSCOP2
3	.322	.567	A1ATECH B8FSCOP2 A1AQUANT
4	.343	.586	A1ATECH B8FSCOP2 A1AQUANT A1ASPEED
5	.346	.588	A1ATECH B8FSCOP2 A1AQUANT A1ASPEED A1AVERBL
6	.351	.592	A1ATECH B8FSCOP2 A1AQUANT A1ASPEED B8FSCNT2 B8FSWRK2

Adjusted R, 6 Predictors	.578
Adjusted R, 11 Predictors	.566

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSDMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCD2
1	.535	.	.	.	.	.	.	.	.	.	.
2	.509	.	.	.	.	.	.	.	.165	.	.
3	.428	.129	.	.	.	.	.	.	.141	.	.
4	.418	.251	.	-.190	.	.	.	.	.165	.	.
5	.372	.207	.117	-.213	.	.	.	.	.156	.	.
6	.420	.246	.	-.174	.089	.	.	.	.148	-.102	.

Note. N = 96. Unadjusted and corrected for range restriction.
[a] MOS Group 2 (31C, 63B).

Table 8.27

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against General Soldiering Proficiency (M8RAWGSP): Optimal Batteries and Weights for 1-6 Predictors, Technical MOS[a]

Number in Model	R-Square	R	Variables in Model
1	.190	.436	A1AQUANT
2	.269	.519	A1AQUANT A1ASPEED
3	.298	.546	A1AQUANT A1ASPEED B8FSSTB2
4	.318	.564	A1AQUANT A1ASPEED B8FSSTB2 A1AVERBL
5	.327	.572	A1AQUANT A1ASPEED B8FSSTB2 A1AVERBL B8FSCNT2
6	.333	.577	A1AQUANT A1ASPEED B8FSSTB2 A1AVERBL B8FSCNT2 B8FSPCD2
Adjusted R, 6 Predictors		.560	
Adjusted R, 11 Predictors		.545	

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSDMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCD2
1	.	.435	.	.	.	.	.	.	.	.	.
2	.	.672	.	-.367	.	.	.	.	.	.	.
3	.	.629	.	-.400	.	.	.	.186	.	.	.
4	.	.480	.232	-.441	.	.	.	.170	.	.	.
5	.	.489	.209	-.461	.	.	.	.132	.	.113	.
6	.	.497	.192	-.469	.	.	.	.151	.	.103	-.076

Note. N = 96. Unadjusted and corrected or range restriction.
[a] MOS Group 2 (31C, 63B).

Table 8.28

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against Effort/Leadership (M8RAWELS): Optimal Batteries and Weights for 1-6 Predictors, Technical MOS[a]

Number in Model	R-Square	R	Variables in Model
1	.215	.464	B8FSWRK2
2	.263	.513	B8FSWRK2 A1AQUANT
3	.285	.534	B8FSWRK2 A1AQUANT A1ASPEED
4	.310	.557	B8FSWRK2 A1AQUANT A1ASPEED B8FSCOP2
5	.325	.570	B8FSWRK2 A1AQUANT A1ASPEED B8FSCOP2 B8FSSTB2
6	.340	.583	B8FSWRK2 A1AQUANT A1ASPEED B8FSCOP2 B8FSDMN2 B8FSPCD2

Adjusted R, 6 Predictors	.568
Adjusted R, 11 Predictors	.556

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSDMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCD2
1	.	.	.	.	.464	.	.	.	.	.	.
2	.	.231	.	.	.387	.	.	.	.	.	.
3	.	.350	.	-.195	.408	.	.	.	.	.	.
4	.	.335	.	-.221	.341	.	.	.	.183	.	.
5	.	.317	.	-.233	.300	.	.	.142	.153	.	.
6	.	.31'	.	-.260	.296	.171	.	.	.168	.	-.141

Note. N = 96. Unadjusted and corrected for range restriction.
[a] MOS Group 2 (31C, 63B).

Table 8.29

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against Personal Discipline (MBRAWMPD): Optimal Batteries and Weights for 1-6 Predictors, Technical MOS[a]

Number in Model	R-Square	R	Variables in Model
1	.069	.263	B8FSSTB2
2	.103	.321	B8FSSTB2 B8FSCNT2
3	.144	.379	B8FSSTB2 B8FSCNT2 B8FSWRK2
4	.150	.387	B8FSSTB2 B8FSCNT2 B8FSWRK2 B8FSCOP2
5	.160	.400	B8FSSTB2 B8FSCNT2 B8FSWRK2 B8FSCOP2 B8FSDPN2
6	.165	.406	B8FSSTB2 B8FSCNT2 B8FSWRK2 B8FSCOP2 B8FSDPN2 A1ASPEED
Adjusted R, 6 Predictors		.379	
Adjusted R, 11 Predictors		.354	

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSCMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCD2
1	.	.	.	.	.	.	.	.263	.	.	.
2	.	.	.	.	.	.	.	.352	.	-.205	.
3	.	.	.	.	.248	.	.	.283	.	-.303	.
4	.	.	.	.	.219	.	.	.261	.086	-.301	.
5	.	.	.	.	.230	.	-.123	.284	.132	-.296	.
6	.	.	.	.075	.226	.	-.136	.276	.124	-.312	.

Note. N = 96. Unadjusted and corrected for range restriction.
[a] MOS Group 2 (31C, 63B).

Table 8.30

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against Physical Fitness (M8RAWPFB): Optimal Batteries and Weights for 1-6 Predictors, Technical MOS*

Number in Model	R-Square	R	Variables in Model
1	.159	.399	B8FSPCD2
2	.188	.434	B8FSPCD2 A1ASPEED
3	.239	.489	B8FSPCD2 A1ASPEED B8FSDMN2
4	.252	.502	B8FSPCD2 A1ASPEED B8FSDMN2 A1AQUANT
5	.291	.539	B8FSPCD2 A1ASPEED B8FSDMN2 A1AQUANT A1AVERBL
6	.304	.551	B8FSPCD2 A1ASPEED B8FSDMN2 A1AQUANT A1AVERBL B8FSWRK2

Adjusted R, 6 Predictors	.535
Adjusted R, 11 Predictors	.521

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSDMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCD2
1	.	.	.	.	.	.	.	.	.	.	.399
2	.	.	.	-.172	.	.	.	.	.	.	.374
3	.	.	.	-.258	.	.248	.	.	.	.	.304
4	.	.156	.	-.350	.	.224	.	.	.	.	.310
5	.	.367	-.334	-.300	.	.268	.	.	.	.	.271
6	.	.367	-.361	-.310	.145	.202	.	.	.	.	.253

Note. N = 96. Unadjusted and corrected for range restriction.
* MOS Group 2 (31C, 63B).

Table 8.31

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against Training/Counseling (M8RAWTCS): Optimal Batteries and Weights for 1-6 Predictors, Technical MOS[a]

Number in Model	R-Square	R	Variables in Model
1	.063	.251	B8FSDMN2
2	.090	.300	B8FSDMN2 A1ASPEED
3	.130	.361	B8FSDMN2 A1ASPEED B8FSCNT2
4	.144	.379	B8FSCNT2 A1ATECH A1AQUANT A1ASPEED
5	.178	.422	B8FSDMN2 A1ASPEED B8FSCNT2 A1ATECH A1AQUANT
6	.199	.446	B8FSDMN2 A1ASPEED B8FSCNT2 A1ATECH A1AQUANT B8FSDPN2

Adjusted R, 6 Predictors	.423
Adjusted R, 11 Predictors	.401

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSDMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCD2
1	.	.	.	.	.	.250	.	.	.	.	.
2	.	.	.	-.173	.	.303	.	.	.	.	.
3	.	.	.	-.236	.	.255	.	.	.	.220	.
4	-.313	.374	.	-.307	.	.	.	.	.	.306	.
5	-.273	.308	.	-.326	.	.204	.	.	.	.257	.
6	-.294	.355	.	-.307	.	.218	-.161	.	.	.280	.

Note. N = 96. Unadjusted and corrected for range restriction.
[a] MOS Group 2 (31C, 63B).

Table 8.32

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against Core Technical Proficiency (M8RAWCTP): Optimal Batteries and Weights for 1-6 Predictors, Support MOS[a]

Number in Model	R-Square	R	Variables in Model
1	.120	.346	A1ATECH
2	.173	.416	A1ATECH A1ASPEED
3	.190	.436	A1ATECH A1ASPEED B8FSDPN2
4	.210	.458	A1ATECH A1ASPEED B8FSDPN2 B8FSDMN2
5	.216	.465	A1ATECH A1ASPEED B8FSDPN2 B8FSDMN2 B8FSWRK2
6	.219	.468	A1ATECH A1ASPEED B8FSDPN2 B8FSDMN2 B8FSWRK2 B8FSSTB2

Adjusted R, 6 Predictors .446
Adjusted R, 11 Predictors .427

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSDMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCD2
1	.347	.	.	.	.	.	.	.	.	.	.
2	.251	.	.	.248	.	.	.	.	.	.	.
3	.271	.	.	.200	.	.	.138	.	.	.	.
4	.294	.	.	.201	.	-.148	.171	.	.	.	.
5	.289	.	.	.194	.102	-.198	.142	.	.	.	.
6	.304	.	.	.192	.119	-.196	.164	-.064	.	.	.

Note. N = 111. Unadjusted and corrected for range restriction.
[a] MOS Group 3 (71L, 91A).

Table 8.33

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against General Soldiering Proficiency (M8RAWGSP): Optimal Batteries and Weights for 1-6 Predictors, Support MOS[a]

Number in Model	R-Square	R	Variables in Model
1	.274	.523	A1ATECH
2	.292	.540	A1ATECH A1ASPEED
3	.301	.549	A1ATECH A1ASPEED B8FSCNT2
4	.306	.553	A1ATECH A1ASPEED B8FSCNT2 B8FSWRK2
5	.308	.555	A1ATECH A1ASPEED B8FSCNT2 B8FSWRK2 B8FSDPN2
6	.312	.559	A1ATECH A1ASPEED B8FSCNT2 B8FSWRK2 B8FSDPN2 B8FSCOP2

Adjusted R, 6 Predictors	.520
Adjusted R, 11 Predictors	.524

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSDMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCD2
1	.523	.	.	.	.	.	.	.	.	.	.
2	.467	.	.	.146	.	.	.	.	.	.	.
3	.470	.	.	.150	.	.	.	.	.	.095	.
4	.477	.	.	.168	-.079	.	.	.	.	.128	.
5	.486	.	.	.149	-.093	.	.060	.	.	.109	.
6	.493	.	.	.155	-.077	.	.094	.	-.076	.108	.

Note. N = 111. Unadjusted and corrected for range restriction.
[a] MOS Group 3 (71L, 91A).

Table 8.34

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against Effort/Leadership (M8RAWELS): Optimal Batteries and Weights for 1-6 Predictors, Support MOS[a]

Number in Model	R-Square	R	Variables in Model
1	.262	.512	A1AQUANT
2	.327	.572	A1AQUANT B8FSWRK2
3	.366	.605	A1AQUANT B8FSWRK2 A1ASPEED
4	.382	.618	A1AQUANT B8FSWRK2 A1ASPEED B8FSSTB2
5	.393	.627	A1AQUANT B8FSWRK2 A1ASPEED B8FSSTB2 B8FSDMN2
6	.401	.633	A1AQUANT B8FSWRK2 A1ASPEED B8FSSTB2 B8FSDMN2 B8FSCNT2

Adjusted R, 6 Predictors	.621
Adjusted R, 11 Predictors	.611

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSDMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCD2
1	.	.512	.	.	.	.	.	.	.	.	.
2	.	.435	.	.	.267	.	.	.	.	.	.
3	.	.275	.	.256	.254	.	.	.	.	.	.
4	.	.2[illegible]5	.	.262	.317	.	.	-.149	.	.	.
5	.	.289	.	.267	.248	.126	.	-.155	.	.	.
6	.	.297	.	.282	.199	.145	.	-.176	.	.104	.

Note. N = 111. Unadjusted and corrected for range restriction.
[a] MOS Group 3 (71L, 91A).

Table 9.35

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against Personal Discipline (M8RAWMPD): Optimal Batteries and Weights for 1-6 Predictors, Support MOS[a]

Number in Model	R-Square	R	Variables in Model
1	.064	.253	B8FSDPN2
2	.079	.281	B8FSDPN2 B8FSCOP2
3	.090	.300	B8FSDPN2 B8FSCOP2 A1ATECH
4	.095	.308	B8FSDPN2 B8FSCOP2 A1ATECH B8FSDMN2
5	.102	.319	B8FSDPN2 B8FSCOP2 A1ATECH B8FSDMN2 B8FSSTB2
6	.106	.326	B8FSDPN2 B8FSCOP2 A1ATECH A1ASPEED B8FSPCD2 B8FSSTB2

Adjusted R, 6 Predictors	.288
Adjusted R, 11 Predictors	.253

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSDMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCD2
1	.	.	.	.	.	.	.253	.	.	.	.
2	.	.	.	.	.	.	.175	.	.146	.	.
3	-.103	.	.	.	.	.	.162	.	.168	.	.
4	-.115	.	.	.	.	.075	.146	.	.166	.	.
5	-.090	.	.	.	.	.092	.183	-.102	.179	.	.
6	-.123	.	.	.100	.	.	.180	-.100	.157	.	.092

Note. N = 111. Unadjusted and corrected for range restriction.
[a] MOS Group 3 (71L, 91A).

Table 8.36

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against Physical Fitness (M8RAWPFB): Optimal Batteries and Weights for 1-6 Predictors, Support MOS[a]

Number in Model	R-Square	R	Variables in Model
1	.142	.377	B8FSPCD2
2	.240	.490	B8FSPCD2 A1ATECH
3	.254	.504	B8FSPCD2 A1ATECH B8FSDPN2
4	.267	.517	B8FSPCD2 A1ATECH B8FSDPN2 B8FSCNT2
5	.271	.521	B8FSPCD2 A1ATECH B8FSDPN2 B8FSCNT2 B8FSCOP2
6	.273	.522	B8FSPCD2 A1ATECH B8FSDPN2 B8FSCNT2 B8FSCOP2 B8FSDMN2

Adjusted R, 6 Predictors .504
Adjusted R, 11 Predictors .488

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSDMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCD2
1	.	.	.	.	.	.	.	.	.	.	.377
2	-.314	.	.	.	.	.	.	.	.	.	.414
3	-.316	.	.	.	.	.	-.118	.	.	.	.420
4	-.311	.	.	.	.	.	-.170	.	.	.128	.425
5	-.320	.	.	.	.	.	-.207	.	.071	.126	.418
6	-.327	.	.	.	.	.054	-.218	.	.072	.123	.401

Note. N = 111. Unadjusted and corrected for range restriction.
[a] MOS Group 3 (71L, 91A).

Table 8.37

Multiple Regression of 4 ASVAB Factors and 7 ABLE-114 Scores Against Training/Counseling (M8RAWTCS): Optimal Batteries and Weights for 1-6 Predictors, Support MOS[a]

Number in Model	R-Square	R	Variables in Model
1	.085	.292	B8FSDPN2
2	.126	.355	B8FSDPN2 B8FSCOP2
3	.138	.371	B8FSDPN2 B8FSCOP2 A1ASPEED
4	.150	.387	B8FSDPN2 B8FSCOP2 A1ASPEED B8FSWRK2
5	.154	.392	B8FSDPN2 B8FSCOP2 A1ASPEED B8FSWRK2 A1AQUANT
6	.162	.402	B8FSDPN2 B8FSCOP2 A1ASPEED B8FSWRK2 A1AQUANT A1ATECH

Adjusted R, 6 Predictors	.375
Adjusted R, 11 Predictors	.350

Parameter Estimates

	A1ATECH	A1AQUANT	A1AVERBL	A1ASPEED	B8FSWRK2	B8FSDMN2	B8FSDPN2	B8FSSTB2	B8FSCOP2	B8FSCNT2	B8FSPCO2
1	.	.	.	.	.	.	.291	.	.	.	.
2	.	.	.	.	.	.	.421	.	-.240	.	.
3	.	.	.	.115	.	.	.399	.	-.262	.	.
4	.	.	.	.126	-.128	.	.431	.	-.230	.	.
5	.	-.088	.	.181	-.111	.	.419	.	-.227	.	.
6	.115	-.166	.	.185	-.110	.	.435	.	-.237	.	.

Note. N = 111. Unadjusted and corrected for range restriction.
[a] MOS Group 3 (71L, 91A).

Table 8.38

Multiple Correlations for 10 Sets of Weights Showing Optimal Weights, All MOS

	M8RAWCTP Weights	M8RAWGSP Weights	M8RAWELS Weights	M8RAWMPD Weights	M8RAWPFB Weights	M8RAWTCS Weights	M8CTPGSP Weights	M8ELSMPD Weights	CRITCGT1 Weights	CRITEMP2 Weights
Core Technical (M8RAWCTP)	**.451**	.436	.331	.165	.193	.195	.446	.298	.434	.154
	(.429)									
General Soldiering (M8RAWGSP)	.553	**.571**	.422	.173	.232	.288	.568	.367	.561	.192
		(.557)								
Effort/ Leadership (M8RAWELS)	.368	.370	**.500**	.375	.046	.358	.372	.489	.404	.422
			(.482)							
Personal Discipline (M8RAWMPD)	.083	.069	.169	**.226**	.057	.130	.075	.197	.094	.188
				(.169)						
Physical Fitness (M8RAWPFB)	.171	.163	.037	.100	**.401**	.055	.168	.059	.135	.235
					(.375)					
Training/ Counseling (M8RAWTCS)	.119	.139	.197	.159	.038	**.275**	.131	.196	.175	.178
						(.231)				
CTP+GSP (M8CTPGSP)	.572	.574	.429	.193	.242	.276	**.578**	.379	.567	.197
							(.564)			
ELS+MPD (M8ELSMPD)	.272	.265	.403	.359	.061	.293	.270	**.412**	.301	.366
								(.387)		
Criterion 1[a] (CRITCGT1)	.514	.524	.431	.223	.180	.339	.524	.390	**.533**	.235
									(.517)	
Criterion 2[b] (CRITEMP2)	.129	.128	.319	.314	.222	.245	.129	.336	.167	**.378**
										(.350)

Note. Rows are criteria; columns are weights corrected for range restriction; multiple $\underline{R}$ for optimal weights in bold; Rozeboom adjustments in parentheses.
[a] Criterion Factor 1 - CTP+GSP+TCS.
[b] Criterion Factor 2 - ELS+MPD+PFB.

Table 8.39

Multiple Correlations for Three Sets of Weights and Eight Criteria Optimal Weights for Each MOS Group Applied to All Others

Core Technical (M8RAWCTP)			
	MOS1 Weights	MOS2 Weights	MOS Weights
MOS1	**.454 (.406)**	.377	.357
MOS2	.485	**.599 (.525)**	.431
MOS3	.303	.295	**.444 (.337)**

General Soldiering (M8RAWGSP)			
	MOS1 Weights	MOS2 Weights	MOS3 Weights
MOS1	**.319 (.234)**	.087	.064
MOS2	.162	**.586 (.509)**	.333
MOS3	.032	.290	**.553 (.483)**

Effort/Leadership (M8RAWELS)			
	MOS1 Weights	MOS2 Weights	MOS3 Weights
MOS1	**.524 (.486)**	.297	.473
MOS2	.443	**.595 (.520)**	.406
MOS3	.461	.336	**.528 (.451)**

Personal Discipline (M8RAWMPD)			
	MOS1 Weights	MOS2 Weights	MOS3 Weights
MOS1	**.363 (.294)**	.079	.119
MOS2	.131	**.416 (.258)**	.082
MOS3	.110	.003	**.326 (.114)**

Note. Rows are MOS group; columns are weights corrected for range restriction; multiple *R* for optimal weights in bold; Rozeboom adjustments in parentheses. MOS Group 1 = Combat specialties (11B, 13B, 19R, 95B/N); MOS Group 2 = Technical specialties (31C, 63 B/N); Group 3 = Support specialties (71L, 91 A/N).

(Continued)

Table 8.39 (Continued)

Multiple Correlations for Three Sets of Weights and Eight Criteria Optimal Weights for Each MOS Group Applied to All Others

Physical Fitness (M8RAWPFB)			
	MOS1 Weights	MOS2 Weights	MOS3 Weights
MOS1	**.368** (.300)	.154	.182
MOS2	.297	**.556** (.469)	.362
MOS3	.268	.339	**.521** (.442)

Training/Counseling (M8RAWTCS)			
	MOS1 Weights	MOS2 Weights	MOS3 Weights
MOS1	**.389** (.327)	.119	.027
MOS2	.177	**.454** (.322)	.093
MOS3	.008	.050	**.362** (.201)

Core Tech/Gen Soldier (M8CTPGSP)			
	MOS1 Weights	MOS2 Weights	MOS3 Weights
MOS1	**.368** (.300)	.236	.217
MOS2	.454	**.664** (.607)	.446
MOS3	.257	.336	**.560** (.492)

Effort-Lead/Discipline (M8ELSMPD)			
	MOS1 Weights	MOS2 Weights	MOS3 Weights
MOS1	**.488** (.445)	.246	.401
MOS2	.335	**.504** (.397)	.309
MOS3	.314	.231	**.395** (.261)

Note. Rows are MOS group; columns are weights corrected for range restriction; multiple R for optimal weights in bold; Rozeboom adjustments in parentheses. MOS Group 1 = Combat specialties (11B, 13B, 19R, 95B/N); MOS Group 2 = Technical specialties (31C, 63 B/N); Group 3 = Support specialties (71L, 91 A/N).

Table 8.40

Multiple Correlations Using Optimal Weights and Mean Multiple Correlations When Weights From the Other Criteria Are Used for Six Criterion Measures

Criterion	Multiple R[a] Using Optimal Weights	Mean R When Using Weights From the Other Criteria
Core Technical (M8RAWCTP)	.429	.264
General Soldiering (M8RAWGSP)	.557	.334
Effort/Leadership (M8RAWELS)	.482	.303
Personal Discipline (M8RAWMPD)	.169	.102
Physical Fitness (M8RAWPFB)	.375	.105
Training/Counseling (M8RAWTCS)	.231	.13
Mean Over Six Criteria	.374	.206

[a] Adjusted by Rozeboom.

Table 8.41

Mean Multiple Correlations for Eight Criteria Computed Across Three MOS Groups When Optimal Weights Are Used[a] and When Weights Obtained From the Other MOS Groups Are Used

Criterion	Mean Adjusted[a] R With Optimal Weights	Mean R Using Weights From the Other MOS Groups
Core Technical (M8RAWCTP)	.423	.375
General Soldiering (M8RAWGSP)	.409	.161
Effort/Leadership (M8RAWELS)	.486	.403
Personal Discipline (M8RAWMPD)	.222	.087
Physical Fitness (M8RAWPFB)	.404	.267
Training/Counseling (M8RAWTCS)	.283	.079
CTP+GSP (M8CTPGSP)	.466	.324
ELS+MPD (M8ELSMPD)	.368	.306

[a] Adjusted by Rozeboom.

SUMMARY CONCLUSIONS

In general, in spite of the small samples for each MOS and the necessity of regarding all mean criterion differences as error (i.e., standardizing criterion scores within MOS), the validities for ASVAB and ABLE were as high, or higher, for predicting second-tour performance as for predicting first-tour performance. Unit weights did not weaken the validities for ASVAB but they did constrain the predictor accuracy of ABLE.

A consistent finding from the hierarchical analysis is that for Core Technical Proficiency, General Soldiering Proficiency, and Effort/Leadership criteria, the optimal predictor battery is never composed of only ASVAB or only ABLE factor scores. For example, the Dependability factor from the ABLE is a constant predictor of the "can do" component of performance.

Finally, based on the above analyses, there appears to be more differential validity across MOS for the second tour samples than was found during the analyses of the first-tour data in CVI.

All of these issues can be analyzed more rigorously when the larger samples and fuller set of predictor measures become available as a result of the second-tour longitudinal (LVII) validation.

Chapter 9
PREDICTION OF SECOND-TOUR PERFORMANCE FROM THE TRIAL BATTERY AND FROM FIRST-TOUR PERFORMANCE

Norman G. Peterson and Rodney L. Rosse

The original research designs for Project A and Career Force include the concept of combining successive pieces of information from (a) predictor tests administered at entry, (b) measures of performance during training, and (c) measures of first-tour job performance to predict individual performance in the second tour of duty. Such a "roll-up" model involves incremental augmentation of predictor information as soldiers move through their careers. Specifically, entry test scores may be combined with known actual performance at any one point so as to make more complete use of available information for prediction of performance in the second or later tour of duty.

The collection of second-tour performance data (CVII data) for at least some members of the Concurrent Validation sample (CVI) presented the first opportunity to examine this concept with empirical data. Test scores (from ASVAB and experimental tests) were expected to predict performance in training. In turn, the test scores and training performance should predict job performance during the first tour of duty. And finally, the test scores, training performance, and first-tour job performance should predict second-tour job performance.

This chapter describes analyses examining the relationship of ASVAB scores (given at the time recruits entered the Army), the CVI predictor scores (i.e., the Project A CVI Trial Battery, the preliminary version of the Experimental Predictor Battery, given during the first tour), and first-tour job performance scores with second-tour job performance scores. However, there were some complications with the analyses. Available sample sizes for this preliminary exploration were extremely small, and it was unclear exactly how to account for range restriction for a sample of this type. The approach to these issues is described below.

THE SAMPLE

There were 121 soldiers in Batch A MOS who had been assessed on at least a subset of measures during the CVI and CVII data collections. Not all 121 soldiers had complete CVI and CVII data. The minimum number of soldiers for a given combination of CVI and CVII measures was 102. Table 9.1 shows the maximum number of soldiers who had CVI and CVII data, by MOS.

MEASURES

Criteria

The second-tour performance criterion CVII measures used in the analysis were the raw and residual scores for the five constructs first identified during the first-tour Concurrent Validation, and confirmed by the CVII modeling analysis (see Chapter 8, "Results of the Second-Tour Validation (CVII)," for more detail on the development of the criterion scores for second-tour performance). These five constructs are called Core Technical

Proficiency, General Soldiering Proficiency, Effort and Leadership, Maintaining Personal Discipline, and Physical Fitness and Military Bearing.

Table 9.1

Numbers of Soldiers With CVI and CVII Data by MOS

MOS		N
11B	Infantryman	8
13B	Cannon Crewman	26
19E	M60 Armor Crewman	4
31C	Single Channel Radio Operator	8
63B	Light-Wheel Vehicle Mechanic	25
64C	Motor Transport Operator	7
71L	Administrative Specialist	15
91A	Medical Specialist	15
95A	Military Police	13
Total		121

Predictors

Predictor measures came from the ASVAB, from the Project A CVI Trial Battery, and from first-tour job performance measures. We used the least-squares weights developed for the CVI criterion constructs rather than developing new weights for CVII criterion constructs because of the extremely limited sample sizes. There were four ASVAB factor composites, six composites of computer-administered test scores, one spatial ability composite, six vocational interest (AVOICE) composites, four temperament/biodata (ABLE) composites, and three composites from the Job Orientation Questionnaire (JOB). These measures and their validities for the CVI sample are fully described in the Summer, 1991 issue of Personnel Psychology (McHenry et al., 1990, Peterson et al., 1990).

The soldiers' scores on these ASVAB and Trial Battery composites were combined by using the least-squares weights developed during CVI analyses for each criterion construct for each MOS. For example, there exists a set of least-squares weights developed during CVI for the four ASVAB factor composite scores for predicting Core Technical Proficiency for each MOS. These weights were applied to the soldiers' ASVAB scores to obtain an "ASVAB-Core Technical" predicted score. This predicted score could then be correlated with the soldiers' Core Technical Proficiency score for CVII.

Predicted scores were computed for each battery/criterion combination separately, that is, for ASVAB/Core Technical Proficiency, ASVAB/General Soldiering Proficiency, ABLE/Core Technical Proficiency, ABLE/Physical Fitness and Military Bearing, and the other combinations. Also computed were predicted scores for ASVAB plus each of the parts of the Trial Battery (e.g., ASVAB + ABLE weighted to predict Core Technical, ASVAB + computer-administered scores weighted to predict Core Technical).

The raw and residual scores achieved by the soldiers on the five criterion constructs during the CVI data collection, or the "first-tour" criterion scores, were also used as predictors of second-tour job performance.

PROCEDURE

CVI predictor scores were correlated with the CVII criterion scores in two ways: (a) correlations were computed within each MOS and these values were averaged (weighted by N), and (b) correlations were computed across the total sample. Correlations with CVII criteria were computed separately for the ASVAB, Spatial, Computer-administered, ABLE, AVOICE, and JOB composites and for the CVI criterion scores. Correlations were also computed for the ASVAB plus each of the other predictor sets from the Trial Battery and the CVI criteria. When the CVI criteria were combined with any of the other predictor scores, they were standardized within MOS (using the larger CVI samples to compute standard scores) and summed to achieve equal weighting between ASVAB/Trial Battery and CVI criterion scores.

There was ample opportunity for restriction of range on all of the predictor measures. The CVII sample is a subset of soldiers who were originally selected for entry into the Army on the basis of their ASVAB scores. Additional range restriction resulted from attrition during Basic and Advanced Individual training. More personnel attrited after training but before the end of their first tour, for a variety of reasons. Finally, many had chosen not to reenlist for a second tour and others had not been qualified to reenlist.

Because of the number of different points at which additional range restriction could occur, there are a number of different "populations" to which the CVII sample could be corrected. If the problem is to select second-tour soldiers from experienced first-tour personnel, then the set of all persons who are nearing completion of the first tour seems the most appropriate population. We decided to consider the latter group as the population and to use the full CVI sample statistics as the estimates of the "population" parameters for making range restriction corrections. All corrections were made using the formula outlined in Lord & Novick (1968, p. 147).

RESULTS

The correlations of scores on the first-tour criteria with scores on second-tour criteria are shown in Tables 9.2 and 9.3 for the raw and residual criteria, respectively. These tables show the weighted means of correlations computed within MOS. The correlations are not corrected for restriction of range. The note for each table shows the mean of the diagonal correlations, which contains the correlations of the same criteria across first and second tour--that is, the correlation of Core Technical between first and second tour, the correlation of General Soldiering between first and second tour, and so on. This mean is an index of convergent validity for the set of criterion constructs. The note also shows the mean of the off-diagonal correlations--that is, the correlations between different criterion constructs across first and second tour. The difference between the mean diagonal and mean off-diagonal correlation can be thought of as an indicator of discriminant validity.

The convergent validities in the two tables range from .16 to .50 and are a bit higher for the raw criteria than for the residual criteria (.33 versus .28, averaged). Both convergent validities are higher than the off-diagonal validities by about the same margin: .18 for the raw criteria and .16 for the residual criteria. Considering the small samples, the size and pattern of these correlations seem impressive.

Table 9.2

Mean Uncorrected Correlations of CVI Raw Criterion Composites with CVII Raw Criterion Composites: Computed Within MOS and Averaged

CVI Composite	CVII Criterion Composite				
	CTP	GSP	ELS	MPD	PFB
Core Technical Proficiency	<u>.37</u>	.43	.19	.04	.05
General Soldiering Proficiency	.45	<u>.40</u>	31	.07	.13
Effort and Leadership	.23	.09	<u>.26</u>	.20	.08
Maintaining Personal Discipline	.13	.21	.07	<u>.16</u>	.08
Physical Fitness and Military Bearing	.04	.03	.15	.22	<u>.48</u>

Note: Ns = 102 - 121. Mean diagonal value = .33; mean off-diagonal value = .15.

Table 9.3

Mean Uncorrected Correlations of CVI Residual Criterion Composites with CVII Residual Criterion Composites: Computed Within MOS and Averaged

CVI Criterion Composite	CVII Criterion Composite				
	CTP	GSP	ELS	MPD	PFB
Core Technical Proficiency	<u>.25</u>	.32	.13	.03	-.03
General Soldiering Proficiency	.24	<u>.22</u>	.24	.06	.03
Effort and Leadership	.08	.17	<u>.28</u>	.12	.20
Maintaining Personal Discipline	.01	.24	.04	<u>.17</u>	.17
Physical Fitness and Military Bearing	-.04	.10	.14	.18	<u>.50</u>

Note: Ns = 102 - 121. Mean diagonal value = .28; mean off-diagonal value = .12.

Tables 9.4 and 9.5 show the same results as Tables 9.2 and 9.3 except that the correlations were computed across the total sample rather than computed within MOS and averaged. The results are very similar. The convergent validities are a bit higher (.06 greater average validity for the raw criteria and .04 greater for the residual criteria), but the off-diagonal validities are within one or two points and the pattern is very similar.

Table 9.4

Uncorrected Correlations Between CVI Raw Criterion Composites and CVII Raw Criterion Composites: Computed Across Total Sample

CVI Criterion Composite	CVII Criterion Composite				
	CTP	GSP	ELS	MPD	PFB
Core Technical Proficiency	.47	.48	.22	.10	.08
General Soldiering Proficiency	.47	.43	.36	.13	.17
Effort and Leadership	.19	.07	.30	.19	.13
Maintaining Personal Discipline	.06	.14	.16	.26	.19
Physical Fitness and Military Bearing	.00	-.04	.15	.15	.48

Note: N = 102 - 121. Mean diagonal value = .39; mean off-diagonal value = .17.

Table 9.5

Uncorrected Correlations Between CVI Residual Criterion Composites and CVII Residual Criterion Composites: Computed Across Total Sample

CVI Criterion Composite	CVII Criterion Composite				
	CTP	GSP	ELS	MPD	PFB
Core Technical Proficiency	.35	.34	.12	.03	-.01
General Soldiering Proficiency	.24	.20	.24	.07	.10
Effort and Leadership	.13	.18	.30	.13	.26
Maintaining Personal Discipline	-.03	.17	.06	.21	.22
Physical Fitness and Military Bearing	-.02	.04	.15	.11	.55

Note: N = 102 - 121. Mean diagonal value = .32; mean off-diagonal value = .13.

Tables 9.6 and 9.7 show the correlations with CVII criteria (raw and residual scores) of predicted scores based on CVI weights for ASVAB and Trial Battery composites, as well as for CVI criterion scores. The values shown are weighted means of correlations computed within MOS. For example, the first cell in the tables shows the mean correlation with scores on CVII Core Technical Proficiency of the predicted scores computed by applying the least-squares weights for ASVAB factors for predicting Core Technical Proficiency in CVI. The correlation in parentheses is corrected for range restriction. The values in the rest of the first line show similar correlations for the other criteria. The values in the second line of the table, labeled CVI, reproduce the diagonal or convergent validities from Tables 9.2 and 9.3, as well as showing the values corrected for range restriction. The rest of the table shows the correlations with CVII criteria of combinations of the ASVAB, Trial Battery composites, and CVI criteria.

Examination of these tables shows that, on the whole, the CVI criterion scores have the highest correlations with CVII criterion scores. The Spatial composite has slightly higher validities for Core Technical and General Soldiering Proficiency (the two "can do" criteria) and the JOB composite has a bit higher validity for Maintaining Personal Discipline, but the CVI criterion scores rank first or second on all five measures. Adding the ASVAB and the ASVAB plus Trial Battery composite scores to CVI scores does increment the CVI validity coefficients for Core Technical and General Soldiering.

The ASVAB validities follow the familiar pattern of predicting the two "can do" criteria, but not predicting the "will do" criteria very well. The Spatial and Computer composites also follow this pattern. The Spatial composite validities on the "can do" criteria are even higher than those for the ASVAB.

As noted, the JOB unexpectedly did the best job of predicting Maintaining Personal Discipline and also predicted Effort and Leadership better than anything except CVI performance. The ABLE correlations are lower than expected for the "will do" criteria. The AVOICE correlations are generally low, but are somewhat greater for the "can do" than for the "will do" criteria. The correlation between the CVI and CVII measures of Physical Fitness and Military Bearing is almost twice as great as the correlation between the ABLE composite and this criterion.

The validities for the raw scores on the CVII criteria (Table 9.6) are generally higher than the validities for the residual criteria (Table 9.7). Also, it appears that correcting for range restriction had little effect on the results. In addition, the within-MOS range restriction corrections had shown little effect.

Table 9.8 and 9.9 show the same data as Tables 9.6 and 9.7 except that the correlations are computed across the total sample and no correlations are shown that have been corrected for range restriction. (Because of important differences between the MOS in terms of criterion construct scores, we did not think it appropriate to perform range restriction corrections across all MOS.) The pattern of correlations appears to be very similar to those shown in Tables 9.6 and 9.7, but the values are generally higher. This may be due to the inclusion of between-MOS differences in the calculation of the correlations across the total sample, which could operate to increase the

Table 9.6

Uncorrected and Corrected Correlations Between CVI-Weighted Predictor Composites, CVI Criterion Composites, and CVII Criterion Composites for Raw Scores: Computed Within MOS and Averaged

Predictor and CVI Criterion Composites and Combinations	CVII Criterion Composite				
	CTP	GSP	ELS	MPD	PFB
ASVAB	.30 (.32)	.37 (.38)	.03 (.00)	-.04 (-.05)	.07 (.08)
CVI Performance	.37 (.40)	.40 (.38)	.26 (.29)	.16 (.15)	.48 (.52)
ASVAB+CVI Performance	.40 (.43)	.47 (.47)	.19 (.15)	.10 (.15)	.34 (.30)
Computer Tests	.23 (.23)	.15 (.19)	-.06 (-.08)	.03 (.05)	.06 (.03)
ASVAB+Computer Tests	.32 (.34)	.36 (.35)	.06 (.04)	.06 (.05)	.12 (.12)
ASVAB+Comp. Tests+CVI Perf.	.41 (.44)	.46 (.47)	.21 (.16)	.17 (.19)	.38 (.33)
AVOICE	.13 (.16)	.12 (.13)	.04 (.06)	-.01 (-.03)	.01 (.01)
ASVAB+AVOICE	.41 (.46)	.37 (.37)	.08 (.05)	.02 (.01)	.10 (.11)
ASVAB+AVOICE+CVI Perf.	.45 (.46)	.48 (.47)	.23 (.23)	.15 (.31)	.34 (.39)
JOB	.11 (.11)	.00 (.02)	.20 (.21)	.22 (.22)	.01 (-.01)
ASVAB+JOB	.28 (.29)	.34 (.34)	.10 (.08)	.17 (.15)	.13 (.13)
ASVAB+JOB+CVI Performance	.38 (.38)	.46 (.45)	.24 (.26)	.24 (.29)	.38 (.33)
Spatial	.42 (.45)	.43 (.45)	.05 (.03)	-.16 (-.18)	.05 (.05)
ASVAB+Spatial	.36 (.40)	.40 (.41)	.01 (-.04)	-.09 (-.11)	.08 (.09)
ASVAB+Spatial+CVI Perf.	.44 (.53)	.47 (.47)	.18 (.16)	.07 (.10)	.35 (.36)
ABLE	.13 (.16)	-.04 (-.05)	.17 (.23)	.11 (.12)	.26 (.27)
ASVAB+ABLE	.32 (.35)	.37 (.38)	.15 (.18)	.07 (.09)	.22 (.23)
ASVAB+ABLE+CVI Performance	.41 (.36)	.48 (.41)	.29 (.27)	.17 (.21)	.44 (.44)

Note: Ns = 102-121. Correlations in parentheses are corrected for range restriction. Coefficients do not require shrinkage adjustments. CVI Criterion Scores and Predictor Composites were standardized within MOS and summed.

Table 9.7

Uncorrected and Corrected Correlations Between CVI-Weighted Predictor Composites, CVI Criterion Composites, and CVII Criterion Composites for Residual Scores: Computed Within MOS and Averaged

Predictor and CVI Criterion Composites and Combinations	CVII Criterion Composite				
	CTP	GSP	ELS	MPD	PFB
ASVAB	.13 (.15)	.14 (.14)	.06 (.06)	.07 (.07)	-.02 (-.01)
CVI Performance	.25 (.27)	.22 (.22)	.28 (.30)	.17 (.18)	.50 (.52)
ASVAB+CVI Performance	.22 (.25)	.23 (.25)	.24 (.23)	.14 (.16)	.31 (.27)
Computer Tests	.16 (.15)	.06 (.09)	-.04 (-.02)	.00 (.01)	.11 (.10)
ASVAB+Computer Tests	.16 (.16)	.10 (.08)	.04 (.02)	.13 (.14)	.03 (.03)
ASVAB+Comp. Tests+CVI Perf.	.23 (.26)	.21 (.23)	.22 (.22)	.18 (.18)	.35 (.30)
AVOICE	.15 (.16)	.04 (.04)	-.01 (.00)	.01 (.02)	.03 (.03)
ASVAB+AVOICE	.26 (.24)	.15 (.15)	.04 (.04)	.14 (.14)	.00 (.02)
ASVAB+AVOICE+CVI Perf.	.29 (.29)	.24 (.25)	.22 (.24)	.19 (.30)	.30 (.35)
JOB	.11 (.12)	-.03 (.00)	.19 (.21)	.18 (.18)	-.06 (-.09)
ASVAB+JOB	.11 (.12)	.10 (.09)	.11 (.11)	.23 (.23)	.02 (.03)
ASVAB+JOB+CVI Performance	.21 (.23)	.21 (.22)	.26 (.26)	.29 (.33)	.33 (.29)
Spatial	.27 (.29)	.24 (.26)	.02 (.00)	.05 (.05)	-.02 (-.06)
ASVAB+Spatial	.16 (.19)	.15 (.18)	.02 (.02)	.01 (.02)	-.01 (-.01)
ASVAB+Spatial+CVI Perf.	.24 (.31)	.22 (.23)	.21 (.22)	.11 (.15)	.32 (.33)
ABLE	.07 (.10)	-.15 (-.17)	.15 (.16)	.10 (.11)	.29 (.32)
ASVAB+ABLE	.16 (.19)	.11 (.14)	.15 (.16)	.12 (.11)	.18 (.19)
ASVAB+ABLE+CVI Performance	.25 (.25)	.22 (.21)	.29 (.26)	.19 (.21)	.42 (.40)

Note: Ns = 102-121. Correlations in parentheses are corrected for range restriction. Coefficients do not require shrinkage adjustments. CVI Criterion Scores and Predictor Composites were standardized within MOS and summed.

Table 9.8

Correlations Between CVI-Weighted Predictor Composites, CVI Criterion Composites, and CVII Criterion Composites for Raw Scores: Computed on Total Sample

Predictor and CVI Criterion Composites and Combinations	CVII Criterion Composite				
	CTP	GSP	ELS	MPD	PFB
ASVAB	.33	.42	.11	-.05	.11
CVI Performance	.47	.43	.30	.26	.48
ASVAB+CVI Performance	.51	.51	.33	.26	.47
Computer Tests	.23	.13	-.01	-.04	.10
ASVAB+Computer Tests	.37	.41	.13	.05	.12
ASVAB+Comp. Tests+CVI Performance	.52	.51	.33	.27	.46
AVOICE	.15	.16	.06	-.02	.06
ASVAB+AVOICE	.43	.44	.14	.00	.13
ASVAB+AVOICE+CVI Performance	.54	.52	.33	.27	.46
JOB	.12	.00	.19	.30	.12
ASVAB+JOB	.33	.41	.16	.20	.16
ASVAB+JOB+CVI Performance	.51	.51	.34	.31	.48
Spatial	.47	.41	.14	-.01	.04
ASVAB+Spatial	.41	.43	.10	-.06	.11
ASVAB+Spatial+CVI Performance	.52	.51	.33	.26	.46
ABLE	.10	.01	.21	.15	.29
ASVAB+ABLE	.34	.41	.22	.12	.25
ASVAB+ABLE+CVI Performance	.51	.52	.36	.30	.47

Note: Ns = 102-121. Correlations are uncorrected for range restriction. Coefficients do not require shrinkage adjustments. CVI Criterion Scores and Predictor Composites were summed.

Table 9.9

Correlations Between CVI-Weighted Predictor Composites, CVI Criterion Composites, and CVII Criterion Composites for Residual Scores: Computed on Total Sample

Predictor and CVI Criterion Composites and Combinations	CVII Criterion Composite				
	CTP	GSP	ELS	MPD	PFB
ASVAB	.17	.20	.12	.09	.07
CVI Performance	.35	.20	.30	.21	.55
ASVAB+CVI Performance	.35	.21	.33	.21	.54
Computer Tests	.21	.06	-.03	-.04	.10
ASVAB+Computer Tests	.22	.16	.13	.13	.07
ASVAB+Comp. Tests+CVI Performance	.36	.21	.33	.22	.53
AVOICE	.16	.09	-.02	.00	.03
ASVAB+AVOICE	.30	.23	.11	.17	.09
ASVAB+AVOICE+CVI Performance	.39	.23	.32	.23	.52
JOB	.08	-.06	.16	.24	.07
ASVAB+JOB	.17	.19	.16	.26	.10
ASVAB+JOB+CVI Performance	.35	.21	.34	.24	.54
Spatial	.33	.19	.07	.07	.04
ASVAB+Spatial	.23	.17	.11	.06	.07
ASVAB+Spatial+CVI Performance	.36	.20	.33	.20	.53
ABLE	.03	-.09	.18	.15	.31
ASVAB+ABLE	.17	.15	.21	.22	.24
ASVAB+ABLE+CVI Performance	.36	.20	.36	.25	.54

Note: Ns = 102-121. Correlations are uncorrected for range restriction. Coefficients do not require shrinkage adjustments. CVI Criterion Scores and Predictor Composites were summed.

value of the correlation over that obtained when the correlations are calculated within MOS and then averaged.

SUMMARY AND CONCLUSION

In sum, these results provide evidence that ASVAB scores, weighted on the basis of regression estimates for predicting first-tour performance, predict second-tour "can do" performance with substantive validity. The results also provide impressive evidence of convergent and discriminant validity of first-tour job performance criteria for predicting second-tour job performance criteria.

Although the Trial Battery composites, especially the Spatial composite, were reasonably successful at predicting second-tour performance, these test scores were collected near the end of the soldier's first tour and not prior to enlistment as were the ASVAB scores. Future analyses of the LVI Experimental Predictor Battery and LVII criterion scores will provide better indications of the new predictors' relationships with second-tour performance.

All analyses were conducted on extremely small subsamples from much larger original samples. The precise reasons for the sample shrinkage are largely unknown and caution must be used in interpreting these results. On the other hand, no analyses used maximization techniques that capitalized on specific sample characteristics and there should be no "shrinkage" in correlations for those reasons. In addition, the pattern of relationships between CVII criterion construct scores and ASVAB/CVI Trial Battery scores was similar to the pattern of relationships between the CVI/criterion construct scores and the ASVAB/CVI Trial Battery scores. This similarity also argues for the stability of the findings.

Chapter 10
OVERALL SUMMARY AND FUTURE PLANS

John P. Campbell

During the second year of the Career Force Project, the major emphases were on building the data file for the Longitudinal Validation cohort, developing the basic scores for the final versions of the Experimental Predictor Battery and the first-tour performance measures, and carrying out the basic longitudinal validation. These activities are at the core of the Project A/Career Force design.

The Longitudinal Validation sample is the major validation sample for the project. It permits a very complete and stringent replication of the estimates of predictive validity obtained using the First-Tour Concurrent Validation Sample (CVI). It also incorporates the validation of the ASVAB and the Experimental Predictor Battery against the major components of training performance. Finally, the individuals from this cohort who reenlisted have been followed up into their second tour, and a major assessment of their performance as junior NCOs is ongoing. The ultimate payoffs from Project A/Career Force will be realized as a result of analyzing the data file generated by this cohort.

SUMMARY OF YEAR TWO

For the analyses conducted during year two, the major questions were:

(1) Did the Experimental Predictor Battery yield the same pattern of basic scores in LVI as it did in CVI?

(2) Did the measures of first-tour performance produce the same model of performance and the same specifications for performance criterion scores as were found in CVI?

(3) In terms of both the level of predictive accuracy and the convergent/discriminant pattern of validities, did the results obtained in the LVI analysis replicate those in CVI?

While the LV/LV_T/LVI cohort was the principal focus of attention, the second-tour performance data collected at the same time from the Second-Tour Concurrent Validation sample (CVII) permitted a preliminary examination of the nature of performance in the second tour, and the accuracy with which it can be predicted from the ASVAB, from the ABLE, and from prior (i.e., first-tour) performance. The questions asked of the second-tour data were the following:

(1) Is the ASVAB a valid predictor of second-tour performance? For which performance components?

(2) Does the ABLE add incremental validity to the prediction of second-tour performance? For which performance components?

(3) Can second-tour performance be predicted from first-tour performance? Is there convergent and discriminant validity across performance components?

The dominant picture of the results of the second-year analysis is one of almost unbelievable consistency between the Concurrent Validation and Longitudinal Validation. The LV predictor scores exhibited the same factor patterns as before, as did the LVI performance scores. For example, the factor analysis of the 10 Army-wide performance rating scales yielded the same three factors and the factor loadings themselves were virtually identical between CVI and LVI. The model of first-tour performance that best fit the LVI data was the model generated in CVI. The hypothesized structural models for training performance (LV_t) and for second-tour performance (LVII) that were based on the CVI model fitting analysis also received the strongest support in the confirmatory tests. Consequently, there is also great consistency in the way the latent structure of performance is described as individuals move from the training environment through their first tour and on into the second tour.

The CVI and LVI cohorts produce the same level and pattern of validities, with the partial exception of the ABLE-ELS relationship, which was lower in LVI than in CVI. This difference on the Effort/Leadership element, while not large in comparison to the extant personnel selection literature, did seem to result from a somewhat heavier weight given to ratings of technical performance by the LVI raters and a somewhat higher Social Desirability response set for the ABLE in LVI. The latter was certainly not unexpected, given the more "gamelike" conditions under which ABLE was administered in the LV sample.

One major benefit from the extensive reanalysis of ABLE scores by ARI researchers was the set of seven factor scores (ABLE - 114 items) described in Chapter 2. In both the LVI and CVII validations this set of scores outperformed all others, and used fewer items.

In general, the ASVAB was again shown to be a very good predictor of the "will do" component of performance as well as a reasonably good predictor of the extra effort and peer leadership and support factor (ELS). The ABLE was again a good predictor of the "will do" components, but was not as accurate for ELS in LVI as it was in CVI.

ASVAB and ABLE also yielded high validities for the appropriate performance components in the second tour. In fact, after the appropriate corrections for range restrictions, the validities were virtually as high in CVII as they were in CVI and LVI, even given the limitations of the CVII sample. As might be expected, the validities of the ASVAB and the Experimental Battery for predicting training performance were even higher. What was even more gratifying was that the differential pattern of validities across training performance components was similar to what was obtained from predicting job performance itself.

Finally, even though the sample size was very small, and between-MOS differences could not be accounted for, the prediction of second-tour performance from first-tour performance (i.e., the CVI/CVII sample) did exhibit substantial predictive validity. It also exhibited the expected differential pattern of results across performance factors, in spite of the

relatively high intercorrelations among some of the factors. This predictability of performance from performance was indeed gratifying and created a great deal of interest in the forthcoming analysis of the data from the larger LVII sample.

Again, the results of the Project A/Career Force analyses done to date exhibit more consistency, in both the level and the pattern of predictive accuracy, than has ever been demonstrated previously in personnel research. Furthermore, the tests of this consistency have been more stringent than ever before (e.g., the use of the same model of performance components across organizational levels <u>and</u> across samples from different cohorts). The basic components of training and job performance can be predicted with considerable accuracy, and with very high consistency.

FUTURE PLANS

During year three, the Career Force Project will concentrate on two major activities. First, the Longitudinal Validation second-tour data collection will be completed and the data file will be cleaned and edited, using the procedures developed in CVI and LVI. Second, the data analysis work will go beyond the basic validation stage to consider a number of important issues pertaining to validity generalization and the optimal prediction of performance, using (a) existing predictors, (b) new predictors, and (c) prior performance.

Consequently, during year three of the Project considerable effort will be devoted to developing the "optimal" prediction equation for each performance component within each MOS under different sets of constraints, such as total testing time or the extent to which the content of ASVAB can be changed. The next order of business will be to begin examining how the optimal equation generalizes (a) across performance components, (b) across MOS, and (c) across organizational levels. That is, to what extent can equations be collapsed across these three parameters without losing significant selection and classification information?

After the extent of validity generalization is known, then we can begin to ask questions about how predictor information should be weighted, how reenlistment decision making can be most appropriately carried out, what the tradeoff should be between using information for selection versus classification, and what the tradeoffs are between maximizing one selection/classification goal versus another (e.g., maximize aggregate performance vs. minimize attrition). These latter activities will carry us well into year four and should provide the Army with valuable information on how to structure its personnel management procedures to best deal with its radically different environment.

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Appendix A

LVI: TASKS AND TESTS IN HANDS-ON AND JOB KNOWLEDGE COMPONENTS

Table A-1

LVI: Tasks and Tests in Hands-On and Job Knowledge Components

Task[a]	HO	JK	Functional Category	Task Factor	Task Construct
11B Infantryman					
Perform CPR		x	First Aid	Safety/Survival	Technical
Administer nerve agent antidote-self		x	First Aid	Safety/Survival	Technical
Apply field or pressure dressing	x	x	First Aid	Safety/Survival	Technical
Put on M17 mask	x	x	Nuc/Bio/Chem	Safety/Survival	Technical
Put on protective clothing		x	Nuc/Bio/Chem	Safety/Survival	Technical
Identify terrain features		x	Navigate	Basic Soldiering	Technical
Navigate on ground		x	Navigate	Basic Soldiering	Technical
Estimate range		x	Navigate	Basic Soldiering	Technical
Prepare M60 range card	x	x	Weapons	Basic Soldiering	Technical
Maintain M16A1	x	x	Weapons	Basic Soldiering	Technical
Load and clear M60	x	x	Weapons	Basic Soldiering	Technical
Set headspace/timing on cal .50	x	x	Weapons	Basic Soldiering	Technical
Zero AN/PVS-4 to M16A1	x	x	Weapons	Basic Soldiering	Technical
Engage with hand grenades	x	x	Field Techniques	Basic Soldiering	Technical
Call for indirect fire		x	Field Techniques	Basic Soldiering	Technical
Collect/report information		x	Field Techniques	Basic Soldiering	Technical
Move over obstacles		x	Field Techniques	Basic Soldiering	Technical
Camouflage self and equipment		x	Field Techniques	Basic Soldiering	Technical
Move under fire		x	Field Techniques	Basic Soldiering	Technical
Install claymore mine	x	x	Field Techniques	Basic Soldiering	Technical
Move over urban terrain	x	x	Field Techniques	Basic Soldiering	Technical
Select position in urban terrain		x	Field Techniques	Basic Soldiering	Technical
Establish observation post		x	Field Techniques	Basic Soldiering	Technical
Select overwatch position		x	Field Techniques	Basic Soldiering	Technical
Operate AN/PVS-5		x	Field Techniques	Basic Soldiering	Technical
Conduct surveillance	x		Field Techniques	Basic Soldiering	Technical
Operate LAW	x		Antitank/AntiAir	Basic Soldiering	Technical
Prepare Dragon for firing	x	x	Antitank/AntiAir	Basic Soldiering	Technical
Operate radio AN/PRC-77	x	x	Communications	Communications	Technical
Identify armor vehicles		x	Identify	Identify Targets	Technical

[a] Short task titles are given.

Table A-1

LVI: Tasks and Tests in Hands-On and Job Knowledge Components (Continued)

Task[a]	HO	JK	Functional Category	Task Factor	Task Construct
13B Cannon Crewmember					
Administer nerve agent antidote-self	x	x	First Aid	Safety/Survival	Basic
Perform CPR		x	First Aid	Safety/Survival	Basic
Prevent shock		x	First Aid	Safety/Survival	Basic
Put on M17 mask	x	x	Nuc/Bio/Chem	Safety/Survival	Basic
Put on protective clothing	x	x	Nuc/Bio/Chem	Safety/Survival	Basic
Decontaminate skin and equipment		x	Nuc/Bio/Chem	Safety/Survival	Basic
Determine azimuth using M-2 compass	x	x	Navigate	Basic Soldiering	Basic
Measure azimuth on map with protractor	x	x	Navigate	Basic Soldiering	Basic
Load and clear M16A1	x	x	Weapons	Basic Soldiering	Basic
Set headspace/timing on cal .50	x	x	Weapons	Basic Soldiering	Basic
Maintain cal .50	x	x	Weapons	Basic Soldiering	Basic
Use visual signals to control movement	x	x	Field Techniques	Basic Soldiering	Basic
Camouflage equipment		x	Field Techniques	Basic Soldiering	Basic
Use challenge and password		x	Customs & Laws	Basic Soldiering	Basic
Install and operate field telephone	x	x	Communications	Communications	Basic
Identify armor vehicles		x	Identify	Identify Targets	Basic
Emplace/recover collimator	x	x	Operate Sights	Technical	Technical
Emplace/recover aiming posts	x	x	Operate Sights	Technical	Technical
Lay howitzer for initial direction	x	x	Operate Sights	Technical	Technical
Boresight DF telescope using DAP	x	x	Operate Sights	Technical	Technical
Sight on target with DF telescope	x	x	Operate Sights	Technical	Technical
Disassemble/assemble breech mechanism	x	x	Operate/Maintain Howitzer	Technical	Technical
Prepare howitzer for operation		x	Operate/Maintain Howitzer	Technical	Technical
Prepare position for howitzer		x	Operate/Maintain Howitzer	Technical	Technical
Prepare DA form 2404		x	Operate/Maintain Howitzer	Technical	Technical
Store ammunition for firing		x	Operate/Maintain Howitzer	Technical	Technical
Drive self-propelled howitzer		x	Operate/Maintain Howitzer	Technical	Technical
Drive prime mover for towed howitzer		x	Operate/Maintain Howitzer	Technical	Technical
Load and fire prepared round		x	Operate/Maintain Howitzer	Technical	Technical
Perform PMCS		x	Operate/Maintain Howitzer	Technical	Technical
Prepare ammunition for firing		x	Operate/Maintain Howitzer	Technical	Technical

[a] Short task titles are given.

Table A-1

LVI: Tasks and Tests in Hands-On and Job Knowledge Components (Continued)

Task*	HO	JK	Functional Category	Task Factor	Task Construct
19E M60 Armor Crewman					
Apply field/pressure dressing	x	x	First Aid	Safety/Survival	Basic
Administer nerve agent antidote-self		x	First Aid	Safety/Survival	Basic
Prevent shock		x	First Aid	Safety/Survival	Basic
Put on M25A1 mask	x		Nuc/Bio/Chem	Safety/Survival	Basic
Put on protective clothing		x	Nuc/Bio Chem	Safety/Survival	Basic
Prepare vehicle for nuclear attack		x	Nuc/Bio/Chem	Safety/Survival	Basic
Identify terrain features		x	Navigate	Basic Soldiering	Basic
Determine grid coordinates	x	x	Navigate	Basic Soldiering	Basic
Maintain M3A1	x	x	Weapons	Basic Soldiering	Basic
Maintain M240 coax	x	x	Weapons	Basic Soldiering	Basic
Maintain .45 cal pistol		x	Weapons	Basic Soldiering	Basic
Collect/report information		x	Field Techniques	Basic Soldiering	Basic
Install claymore mine		x	Field Techniques	Basic Soldiering	Basic
Identify minefield markers		x	Field Techniques	Basic Soldiering	Basic
Know rights as POW		x	Customs & Laws	Basic Soldiering	Basic
Use automated CEOI	x	x	Communications	Communications	Basic
Send radio message	x	x	Communications	Communications	Basic
Operate radio AN/VRC-64	x	x	Communications	Communications	Basic
Identify armor vehicles		x	Identify	Identify Targets	Basic
Operate gas particulate filter unit	x	x	Operate Tanks	Technical	Technical
Start/stop tank engine	x	x	Operate Tanks	Technical	Technical
Remove/install track block	x	x	Operate Tanks	Technical	Technical
Escape from tank	x	x	Operate Tanks	Technical	Technical
Extinguish fire in tank		x	Operate Tanks	Technical	Technical
Boresight/system calibrate M60A3 tank	x	x	Tank Gunnery	Technical	Technical
Prepare loader's station for operation	x	x	Tank Gunnery	Technical	Technical
Perform prepare-to-fire checks	x	x	Tank Gunnery	Technical	Technical
Load/unload main gun		x	Tank Gunnery	Technical	Technical
Engage targets with main gun		x	Tank Gunnery	Technical	Technical
Apply misfire procedures		x	Tank Gunnery	Technical	Technical

* Short task titles are given.

Table A-1

LVI: Tasks and Tests in Hands-On and Job Knowledge Components (Continued)

Task[*]	HO	JK	Functional Category	Task Factor	Task Construct
19K Tank Crewman					
Apply field/pressure dressing	x	x	First Aid	Safety/Survival	Basic
Administer nerve agent antidote-self		x	First Aid	Safety/Survival	Basic
Put on protective clothing	x	x	Nuc/Bio Chem	Safety/Survival	Basic
Conduct hasty decontamination		x	Nuc/Bio/Chem	Safety/Survival	Basic
Conduct unmasking procedures		x	Nuc/Bio/Chem	Safety/Survival	Basic
Use M8 chemical alarm system		x	Nuc/Bio/Chem	Safety/Survival	Basic
Determine grid coordinates	x	x	Navigate	Basic Soldiering	Basic
Determine location by association		x	Navigate	Basic Soldiering	Basic
Analyze terrain using five aspects		x	Navigate	Basic Soldiering	Basic
Maintain cal .50 M2 HB machinegun	x	x	Weapons	Basic Soldiering	Basic
Maintain M240 coax	x	x	Weapons	Basic Soldiering	Basic
Maintain .45 cal pistol	x	x	Weapons	Basic Soldiering	Basic
Identify minefield markers		x	Field Techniques	Basic Soldiering	Basic
Use challenge and password		x	Customs & Laws	Basic Soldiering	Basic
Use automated CEOI	x	x	Communications	Communications	Basic
Send radio message	x	x	Communications	Communications	Basic
Establish/enter/leave radio net	x	x	Communications	Communications	Basic
Identify armor vehicles		x	Identify	Identify Targets	Basic
Troubleshoot tank systems		x	Operate Tank	Technical	Technical
Recover an M1 tank by similar vehicle		x	Operate Tank	Technical	Technical
Manually remove main gun round		x	Operate Tank	Technical	Technical
Boresight/system calibrate M1 tank	x	x	Operate Tank	Technical	Technical
Prepare driver's station for operation	x	x	Operate Tank	Technical	Technical
Perform loader's prep-to-fire checks		x	Operate Tank	Technical	Technical
Load/unload 105-mm main gun		x	Operate Tank	Technical	Technical
Operate ammo doors manually	x	x	Tank Gunnery	Technical	Technical
Perform before operations PMCS	x	x	Tank Gunnery	Technical	Technical
Operate AN/VVS-2 in loader's hatch	x	x	Tank Gunnery	Technical	Technical
Perform operator maintenance on M9	x	x	Tank Gunnery	Technical	Technical
Use visual signals	x	x	Tank Gunnery	Technical	Technical
Evacuate wounded crewman from M1 tank		x	Tank Gunnery	Technical	Technical

[*] Short task titles are given.

Table A-1

LVI: Tasks and Tests in Hands-On and Job Knowledge Components (Continued)

Task[a]	HO	JK	Functional Category	Task Factor	Task Construct
<u>31C Single Channel Radio Operator</u>					
Apply field/pressure dressing	x	x	First Aid	Safety/Survival	Basic
Perform CPR		x	First Aid	Safety/Survival	Basic
Put on protective clothing	x	x	Nuc/Bio/Chem	Safety/Survival	Basic
Decontaminate skin and equipment		x	Nuc/Bio/Chem	Safety/Survival	Basic
Maintain M17 mask		x	Nuc/Bio/Chem	Safety/Survival	Basic
Determine grid coordinates	x	x	Navigate	Basic Soldiering	Basic
Load and clear M16A1	x	x	Weapons	Basic Soldiering	Basic
Maintain M16A1		x	Weapons	Basic Soldiering	Basic
Practice noise/light/litter discipline		x	Field Techniques	Basic Soldiering	Basic
Know your rights as POW		x	Customs & Laws	Basic Soldiering	Basic
Establish/enter/leave radio net	x	x	Communications	Communications	Basic
Use KTC 1400 Ciper/Authentication System	x	x	Communications	Communications	Basic
Identify armor vehicles		x	Identify	Identify Targets	Basic
Perform PMCS on truck	x	x	Drive	Vehicles	Basic
Recognize ECM and implement ECCM	x	x	Teletype Operations	Technical	Technical
Prepare message in 16-line format	x	x	Teletype Operations	Technical	Technical
Operate in radio nets		x	Teletype Operations	Technical	Technical
Handle classified equipment & material		x	Teletype Operations	Technical	Technical
Install radioteletype	x	x	Install Teletype Equipment	Technical	Technical
Install radio set	x	x	Install Teletype Equipment	Technical	Technical
Erect doublet antenna		x	Install Teletype Equipment	Technical	Technical
Erect expedient antennas		x	Install Teletype Equipment	Technical	Technical
Operate radioteletype	x	x	Operate Teletype Equipment	Technical	Technical
Operate terminal commo set	x	x	Operate Teletype Equipment	Technical	Technical
Operate radio control group		x	Operate Teletype Equipment	Technical	Technical
Troubleshoot radioteletype		x	Maintain Teletype Equipment	Technical	Technical
Troubleshoot radio set		x	Maintain Teletype Equipment	Technical	Technical
Perform PMCS on terminal commo set		x	Maintain Teletype Equipment	Technical	Technical
Operate generator set PU-620	x	x	Generators	Technical	Technical
Troubleshoot generator set PU-620	x	x	Generators	Technical	Technical

[a] Short task titles are given.

Table A-1

LVI: Tasks and Tests in Hands-On and Job Knowledge Components (Continued)

Task[a]	HO	JK	Functional Category	Task Factor	Task Construct
<u>63B Light Wheel Vehicle Mechanic</u>					
Apply field/pressure dressing	x	x	First Aid	Safety/Survival	Basic
Administer nerve agent antidote-casualty		x	First Aid	Safety/Survival	Basic
Put on protective clothing		x	Nuc/Bio/Chem	Safety/Survival	Basic
Put on M17 mask	x	x	Nuc/Bio/Chem	Safety/Survival	Basic
Determine grid coordinates		x	Navigate	Basic Soldiering	Basic
Determine magnetic azimuth w/compass	x	x	Navigate	Basic Soldiering	Basic
Maintain M16A1		x	Weapons	Basic Soldiering	Basic
Load and clear M16A1	x	x	Weapons	Basic Soldiering	Basic
Camouflage equipment		x	Field Techniques	Basic Soldiering	Basic
Use challenge and password	x	x	Customs & Laws	Basic Soldiering	Basic
Maintain assigned toolkit	x	x	Vehicle Recovery	Vehicle	Basic
Perform expedient repairs		x	Vehicle Recovery	Vehicle	Basic
Slave start disabled vehicle		x	Vehicle Recovery	Vehicle	Basic
Tow disabled vehicle w/5 ton wrecker		x	Vehicle Recovery	Vehicle	Basic
Perform annual PMCS (truck)		x	Vehicle Recovery	Vehicle	Basic
Repair electrical wiring	x	x	Electrical System	Technical	Technical
Troubleshoot electrical system	x	x	Electrical System	Technical	Technical
Replace starter		x	Electrical System	Technical	Technical
Replace air hydraulic cylinder	x	x	Brake/Steering/Suspension	Technical	Technical
Replace wheel bearings	x	x	Brake/Steering/Suspenion	Technical	Technical
Replace service brakes	x	x	Brake/Steering/Suspension	Technical	Technical
Troubleshoot service brake malfunctions	x	x	Brake/Steering/Suspension	Technical	Technical
Troubleshoot brake system malfunctions		x	Brake/Steering/Suspension	Technical	Technical
Troubleshoot steering system		x	Brake/Steering/Suspension	Technical	Technical
Replace fuel pump	x	x	Fuel/Cooling/Lubrication	Technical	Technical
Troubleshoot fuel system malfunctions	x	x	Fuel/Cooling/Lubrication	Technical	Technical
Troubleshoot engine cooling system		x	Fuel/Cooling/Lubrication	Technical	Technical
Replace radiator		x	Fuel/Cooling/Lubrication	Technical	Technical
Troubleshoot engine		x	Power Train/Clutch	Technical	Technical

[a] Short task titles are given.

Table A-1

LVI: Tasks and Tests in Hands-On and Job Knowledge Components (Continued)

Task*	HO	JK	Functional Category	Task Factor	Task Construct
71L Administrative Specialist					
Apply field/pressure dressing	x		First Aid	Safety/Survival	Basic
Administer nerve agent antidote-self		x	First Aid	Safety/Survival	Basic
Put on protective clothing		x	Nuc/Bio/Chem	Safety/Survival	Basic
Put on M17 mask	x	x	Nuc/Bio/Chem	Safety/Survival	Basic
Maintain M17 mask		x	Nuc/Bio/Chem	Safety/Survival	Basic
Determine grid coordinates	x	x	Navigate	Basic Soldiering	Basic
Determine magnetic azimuth w/compass	x	x	Navigate	Basic Soldiering	Basic
Maintain M16A1	x	x	Weapons	Basic Soldiering	Basic
Load and clear M16A1		x	Weapons	Basic Soldiering	Basic
Camouflage self and equipment		x	Field Techniques	Basic Soldiering	Basic
Practice noise/light/litter discipline		x	Field Techniques	Basic Soldiering	Basic
Know rights as POW		x	Customs & Laws	Basic Soldiering	Basic
Request publications/blank forms	x		Forms/files management	Technical	Technical
File documents and correspondence	x	x	Forms/files management	Technical	Technical
Type straight copy material	x		Correspondence	Correspondence	Technical
Type military orders	x	x	Correspondence	Correspondence	Technical
Type second comment to DF	x	x	Correspondence	Correspondence	Technical
Type a joint messageform	x	x	Correspondence	Correspondence	Technical
Type memorandum	x	x	Correspondence	Correspondence	Technical
Type basic comment to DF	x	x	Correspondence	Correspondence	Technical
Dispatch outgoing distribution		x	Correspondence	Correspondence	Technical
Assemble correspondence		x	Correspondence	Correspondence	Technical
Control supplies		x	Supervision/coordination	Technical	Technical
Receive/control office equipment		x	Supervision/coordination	Technical	Technical
Receipt/transfer classified material	x	x	Classified material	Technical	Technical
Safeguard FOUO material		x	Classified material	Technical	Technical

* Short task titles are given.

Table A-1

LVI: Tasks and Tests in Hands-On and Job Knowledge Components (Continued)

Task[a]	HO	JK	Functional Category	Task Factor	Task Construct
88M Motor Transport Operator					
Apply field/pressure dressing	x	x	First Aid	Safety/Survival	Basic
Administer nerve agent antidote-self	x	x	First Aid	Safety/Survival	Basic
Administer nerve agent antidote-casualty	x	x	First Aid	Safety/Survival	Basic
Perform CPR		x	First Aid	Safety/Survival	Basic
Put on protective clothing	x	x	Nuc/Bio/Chem	Safety/Survival	Basic
Put on M17 mask	x	x	Nuc/Bio/Chem	Safety/Survival	Basic
Decontaminate skin and equipment		x	Nuc/Bio/Chem	Safety/Survival	Basic
Decontaminate equipment w/ABC M11	x	x	Nuc/Bio/Chem	Safety/Survival	Basic
Use M8 detector paper	x	x	Nuc/Bio/Chem	Safety/Survival	Basic
Determine grid coordinates	x	x	Navigate	Basic Soldiering	Basic
Measure distance on a map	x	x	Navigate	Basic Soldiering	Basic
Maintain M16A1	x	x	Weapons	Basic Soldiering	Basic
Load and clear M16A1	x	x	Weapons	Basic Soldiering	Basic
Load and clear M60	x	x	Weapons	Basic Soldiering	Basic
Camouflage equipment		x	Field Techniques	Basic Soldiering	Basic
Collect/report information		x	Field Techniques	Basic Soldiering	Basic
Use challenge and password		x	Customs & Laws	Basic Soldiering	Basic
Visually identify threat aircraft		x	Identify	Identify Targets	Basic
Couple semitrailer	x		Drive	Vehicles	Basic
Uncouple semitrailer	x		Drive	Vehicles	Basic
Operate tractor and semitrailer	x	x	Drive	Vehicles	Basic
Perform operator/crew PMCS		x	Drive	Vehicles	Basic
Operate vehicle in convoy		x	Drive	Vehicles	Basic
Operate vehicle off road		x	Drive	Vehicles	Basic
Operate vehicle in snow and ice		x	Drive	Vehicles	Basic
Transport general cargo		x	Drive	Vehicles	Basic
Drive vehicle under blackout		x	Drive	Vehicles	Basic
Use defense when ambushed or attacked		x	Drive	Vehicles	Basic
Fill out SF 91 (Accident Report)		x	Drive	Vehicles	Basic
Perform vehicle emergency/recovery		x	Drive	Vehicles	Basic

[a] Short task titles are given.

Table A-1

LVI: Tasks and Tests in Hands-On and Job Knowledge Components (Continued)

Task[a]	HO	JK	Functional Category	Task Factor	Task Construct
91A Medical Specialist					
Apply Field/pressure dressing	x	x	First Aid	Safety/Survival	Basic
Perform CPR	x	x	First Aid	Safety/Survival	Basic
Splint a suspected fracture	x	x	First Aid	Safety/Survival	Basic
Prevent shock		x	First Aid	Safety/Survival	Basic
Evaluate a casualty		x	First Aid	Safety/Survival	Basic
Replace filters in M17 protective mask		x	Nuc/Bio/Chem	Safety/Survival	Basic
Put on protective clothing		x	Nuc/Bio/Chem	Safety/Survival	Basic
Decontaminate skin and equipment		x	Nuc/Bio/Chem	Safety/Survival	Basic
Determine grid coordinates	x	x	Navigate	Basic Soldiering	Basic
Load and clear M16A1		x	Weapons	Basic Soldiering	Basic
Move over obstacles		x	Field Techniques	Basic Soldiering	Basic
Practice noise/light/litter discipline		x	Field Techniques	Basic Soldiering	Basic
Identify armor vehicles		x	Identify	Identify Targets	Basic
Conduct PMCS		x	Drive	Vehicles	Basic
Open the airway	x	x	Clinic/Ward Treatment	Technical	Technical
Initiate field medical card	x	x	Clinic/Ward Treatment	Technical	Technical
Treat for shock (hypovolemic)		x	Clinic/Ward Treatment	Technical	Technical
Manage patient with IV		x	Clinic/Ward Treatment	Technical	Technical
Assist with sick call procedures		x	Clinic/Ward Treatment	Technical	Technical
Initiate an IV infusion	x	x	Clinic/Ward Treatment	Technical	Technical
Measure and record pulse	x	x	Clinic/Ward Treatment	Technical	Technical
Measure and record respirations	x	x	Clinic/Ward Treatment	Technical	Technical
Assemble needle/syringe	x	x	Clinic/Ward Treatment	Technical	Technical
Measure and record blood pressure	x	x	Clinic/Ward Treatment	Technical	Technical
Change sterile dressing	x	x	Clinic/Ward Treatment	Technical	Technical
Administer an injection	x	x	Clinic/Ward Treatment	Technical	Technical
Establish/maintain a sterile field	x	x	Clinic/Ward Treatment	Technical	Technical
Triage		x	Clinic/Ward Treatment	Technical	Technical
Draft/file TPR charts (SF 511)		x	Clinic/Ward Management	Technical	Technical

[a] Short task titles are given.

Table A-1

LVI: Tasks and Tests in Hands-On and Job Knowledge Components (Continued)

Task[a]	HO	JK	Functional Category	Task Factor	Task Construct
95B Military Police					
Apply field/pressure dressing	x	x	First Aid	Safety/Survival	Basic
Perform CPR		x	First Aid	Safety/Survival	Basic
Decontaminate skin and equipment		x	Nuc/Bio/Chem	Safety/Survival	Basic
Put on M17 mask	x	x	Nuc/Bio/Chem	Safety/Survival	Basic
Maintain M17 mask		x	Nuc/Bio/Chem	Safety/Survival	Basic
Determine magnetic azimuth w/compass	x	x	Navigate	Basic Soldiering	Basic
Estimate range	x	x	Navigate	Basic Soldiering	Basic
Navigate on ground	x	x	Navigate	Basic Soldiering	Basic
Determine grid coordinates	x	x	Navigate	Basic Soldiering	Basic
Load and clear M16A1	x	x	Weapons	Basic Soldiering	Basic
Load and clear M60	x	x	Weapons	Basic Soldiering	Basic
Engage targets with M16A1	x		Weapons	Basic Soldiering	Basic
Maintain M9/cal .45/cal .38	x	x	Weapons	Basic Soldiering	Basic
Call for/adjust indirect fire		x	Field Techniques	Basic Soldiering	Basic
Camouflage self and equipment		x	Field Techniques	Basic Soldiering	Basic
Move under direct fire		x	Field Techniques	Basic Soldiering	Basic
React to hostile fire during convoy		x	Field Techniques	Basic Soldiering	Basic
Prepare/operate FM radio sets		x	Communications	Communications	Basic
Use automated CEOI		x	Communications	Communications	Basic
Identify armor vehicles		x	Identify	Identify Targets	Basic
Perform operator/crew PMCS	x	x	Drive	Vehicles	Basic
Respond to domestic disturbance		x	Respond to Alarms	Technical	Technical
Respond to traffic accident		x	Respond to Alarms	Technical	Technical
React to sniper fire		x	Respond to Alarms	Technical	Technical
Decide when to use force		x	Conduct MP Procedures	Technical	Technical
Requirements for lawful apprehension		x	Conduct MP Procedures	Technical	Technical
Use hand/arm signals to direct traffic	x	x	Patrol Duties	Technical	Technical
Prepare MP reports and forms	x	x	Patrol Duties	Technical	Technical
Operate dismount point	x	x	Patrol Duties	Technical	Technical
Collect and process evidence		x	Patrol Duties	Technical	Technical
Perform patrol duties		x	Patrol Duties	Technical	Technical

[a] Short task titles are given.

Appendix B

LVI HANDS-ON TESTS: AMOUNT OF MISSING DATA

Table B-1

LVI Hands On - 11B Amount of Missing Data by Task and Step (percent)

Step	XHA4	XHB5	XHB6	FHB9	FHBA	FHBB	FHBC	XHD1	FHE4	XHI	FHJ1	XHB4	FHL1
1	0.34	0.67	0.00	1.79	0.56	1.90	24.80	7.49	1.90	1.68	0.78	0.89	3.21
2	0.67	0.45	10.3	2.23	0.56	1.90	4.58	7.49	1.90	1.56	1.56	0.89	3.10
3	0.56	0.78	10.8	2.46	0.56	1.90	15.20	7.49	1.90	1.79	0.67	0.78	1.11
4	0.56	0.78	11.3	0.56	0.78	2.12	9.27	7.93	2.23	2.12	0.78	0.78	1.33
5	1.90	0.56	11.9	0.45	13.52	1.90	5.70	7.60	-	1.90	1.12	0.78	1.44
6	1.56	0.67	10.8	1.12	0.45	2.12	12.63	9.16	-	1.45	0.67	0.78	1.22
7	0.67	1.34	10.8	-	0.78	2.23	5.59	16.20	-	1.45	0.78	17.50	1.11
8	0.67	1.12	11.9	-	2.35	1.90	10.95	9.50	-	2.12	0.89	1.00	1.22
9	1.12	0.67	9.8	-	0.67	2.23	4.58	-	-	3.35	0.78	0.89	6.20
10	1.01	0.78	11.9	-	1.68	2.01	10.50	-	-	1.56	0.67	0.78	-
11	1.12	0.45	12.4	-	0.78	2.01	-	-	-	1.68	-	0.78	-
12	1.23	0.45	12.9	-	2.23	2.01	-	-	-	2.91	-	0.78	-
13	1.34	0.45	12.9	-	2.23	2.23	-	-	-	1.56	-	0.78	-
14	1.34	0.78	19.6	-	1.68	2.79	-	-	-	1.56	-	0.78	-
15	1.68	0.56	18.0	-	-	2.46	-	-	-	1.56	-	0.78	-
16	-	0.56	18.0	-	-	2.46	-	-	-	1.45	-	1.88	-
17	-	0.78	19.1	-	-	2.68	-	-	-	1.56	-	0.89	-
18	-	0.56	19.6	-	-	2.01	-	-	-	2.35	-	0.78	-
19	-	0.67	18.6	-	-	2.12	-	-	-	1.90	-	0.89	-
20	-	0.55	20.1	-	-	2.46	-	-	-	1.90	-	1.00	-
21	-	0.56	18.0	-	-	2.23	-	-	-	1.90	-	1.00	-
22	-	0.89	18.0	-	-	2.46	-	-	-	1.90	-	0.78	-
23	-	0.78	18.6	-	-	2.12	-	-	-	2.01	-	0.89	-
24	-	0.56	18.6	-	-	2.23	-	-	-	3.13	-	1.11	-
25	-	0.56	18.6	-	-	2.46	-	-	-	3.13	-	0.78	-
26	-	0.67	18.6	-	-	2.46	-	-	-	-	-	0.78	-
27	-	-	18.6	-	-	2.01	-	-	-	-	-	0.78	-
28	-	-	20.6	-	-	2.68	-	-	-	-	-	1.00	-
29	-	-	19.6	-	-	2.01	-	-	-	-	-	0.89	-
30	-	-	19.6	-	-	2.46	-	-	-	-	-	17.39	-
31	-	-	19.6	-	-	2.01	-	-	-	-	-	1.44	-
32	-	-	19.6	-	-	2.57	-	-	-	-	-	1.33	-
33	-	-	-	-	-	2.01	-	-	-	-	-	1.00	-
34	-	-	-	-	-	-	-	-	-	-	-	0.78	-
35	-	-	-	-	-	-	-	-	-	-	-	0.78	-
36	-	-	-	-	-	-	-	-	-	-	-	0.78	-
37	-	-	-	-	-	-	-	-	-	-	-	1.33	-
38	-	-	-	-	-	-	-	-	-	-	-	1.33	-
39	-	-	-	-	-	-	-	-	-	-	-	1.33	-
40	-	-	-	-	-	-	-	-	-	-	-	1.33	-
41	-	-	-	-	-	-	-	-	-	-	-	1.44	-
42	-	-		-	-	-	-	-	-	-	-	1.44	-
43	-	-	-	-	-	-	-	-	-	-	-	1.33	-

XHA4 - Put on Field Dressing
FHBA - Prepare Dragon for Firing
FHE4 - Operate Radio AN/PRC-77
FHL1 - Zero AN/PVS-4 on M16
XHB5 - Load/Reduce/Clear M60
FHBB - M60 Range Card
XHI1 - Install/Fire M18 Claymore
XHB6 - Cal .50 Headspace/Timing
FHBC - Engage Targets with LAW
FHJ1 - Urban Terrain Movement
FHB9 - Engage Targets with Grenades
XHD1 - Put on M17 Mask
XHB4 - M16 Operator Maintenance

FHG9 - Day & Night Surveillance not imputed at the step level

Table B-2

IVI Hands On - 13B (Track M109) Amount of Missing Data by Task and Step (percent)

Step	XHA3	XHB3	XHB6	DHB7	DHC4	DHC5	XHD1	XHD3	DHE3	DHI2	DHI4	DHI3	DHI5	DHI6	DHI7	DHJ1
1	6.05	0.86	1.60	4.97	0.99	0.37	0.00	3.21	1.48	5.43	2.35	0.17	0.00	0.00	0.17	0.00
2	5.19	0.86	1.60	4.69	0.99	0.49	0.00	3.21	1.23	5.19	14.94	0.00	0.00	0.28	0.52	0.36
3	5.19	0.86	1.60	4.69	5.06	0.37	0.00	3.33	1.36	5.19	1.11	0.00	0.00	0.00	0.35	9.32
4	5.19	0.86	1.73	4.20	5.06	0.37	0.26	3.46	1.36	5.31	1.23	0.17	0.00	0.28	0.00	9.32
5	5.06	0.86	1.60	4.32	5.19	0.37	0.00	5.31	2.10	5.19	14.07	0.52	0.00	0.00	0.35	8.96
6	5.19	0.99	1.73	4.57	5.06	-	2.21	2.96	14.07	5.31	1.11	0.34	0.00	0.28	0.35	8.96
7	5.06	1.11	1.73	4.44	-	-	11.83	3.46	25.93	5.19	1.48	0.52	0.34	10.60	0.17	9.32
8	5.19	0.99	3.09	4.57	-	-	2.99	8.64	36.05	5.43	13.70	0.52	13.27	-	0.35	8.96
9	5.31	1.23	1.73	4.32	-	-	-	8.64	1.11	5.19	2.59	0.34	-	-	0.52	0.36
10	5.56	1.11	1.48	4.44	-	-	-	3.21	0.86	5.31	2.35	0.17	-	-	0.17	0.00
11	5.19	1.11	1.48	4.44	-	-	-	14.94	1.11	-	2.47	0.69	-	-	1.22	0.72
12	5.06	1.11	1.73	4.44	-	-	-	12.74	0.99	-	15.19	6.37	-	-	1.57	0.00
13	5.19	1.11	2.22	4.32	-	-	-	12.22	1.11	-	-	0.17	-	-	0.35	0.00
14	5.06	1.11	2.10	4.94	-	-	-	12.22	1.23	-	-	0.69	-	-	0.35	0.00
15	5.06	1.48	1.98	4.94	-	-	-	12.59	-	-	-	0.34	-	-	0.35	0.00
16	8.77	1.48	2.10	4.69	-	-	-	12.47	-	-	-	0.17	-	-	0.35	0.36
17	-	1.60	1.98	4.81	-	-	-	12.35	-	-	-	0.52	-	-	0.17	1.43
18	-	1.73	2.10	4.81	-	-	-	12.22	-	-	-	0.69	-	-	0.17	1.43
19	-	1.60	2.22	4.69	-	-	-	12.35	-	-	-	1.38	-	-	0.17	1.79
20	-	1.98	2.22	4.81	-	-	-	12.35	-	-	-	6.71	-	-	0.52	0.36
21	-	-	2.10	4.69	-	-	-	12.22	-	-	-	0.34	-	-	0.70	0.00
22	-	-	2.59	4.69	-	-	-	12.10	-	-	-	0.34	-	-	1.57	2.15
23	-	-	2.10	4.69	-	-	-	4.32	-	-	-	0.52	-	-	6.62	0.36
24	-	-	2.10	4.69	-	-	-	3.83	-	-	-	0.86	-	-	6.79	0.00
25	-	-	2.10	4.69	-	-	-	4.07	-	-	-	0.52	-	-	0.87	0.00
26	-	-	2.10	4.69	-	-	-	3.83	-	-	-	0.34	-	-	1.05	0.72
27	-	-	2.10	-	-	-	-	3.95	-	-	-	0.34	-	-	3.66	8.96
28	-	-	2.10	-	-	-	-	4.07	-	-	-	2.75	-	-	-	8.96
29	-	-	2.47	-	-	-	-	6.17	-	-	-	-	-	-	-	8.96
30	-	-	2.22	-	-	-	-	6.79	-	-	-	-	-	-	-	9.32
31	-	-	2.22	-	-	-	-	8.27	-	-	-	-	-	-	-	9.32
32	-	-	2.10	-	-	-	-	8.27	-	-	-	-	-	-	-	1.79
33	-	-	-	-	-	-	-	7.65	-	-	-	-	-	-	-	0.00
34	-	-	-	-	-	-	-	6.54	-	-	-	-	-	-	-	0.00
35	-	-	-	-	-	-	-	5.56	-	-	-	-	-	-	-	0.00
36	-	-	-	-	-	-	-	10.62	-	-	-	-	-	-	-	0.36
37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

XHA3 - Nerve Agent Antidote
DHC4 - Measure Azimuth with Compass
DHI2 - Use Visual Signals
DHI6 - Sight on Target (M109)
XHB3 - Load/Reduce/Clear M16
DHC5 - Measure Azimuth with Protractor
DHI4 - Emplace Aiming Posts
DHI7 - Lay Howitzer (M109, M110)
XHB6 - Cal .50 Headspace/Timing
XHD1 - Put on M17 Mask
DHI3 - Collimator (M109, M110)
DHJ1 - Breech Mech. (M109)
DHB7 - Cal .50 Operator Maintenance
DHE3 - Install Field Telephone
DHI5 - Boresight Tel.-DAP (M109)
XHD3 - Put on/Wear MOPP

Table B-3

LVI Hands On - 13B (Track M110) Amount of Data Missing by Task and Step (percent)

Step	XHA3	XHB3	XHB6	DHB7	DHC4	DHC5	XHD1	XHD3	DHE3	DHI2	DHI4	DHIB	DHIA	DHI7	DHJ4	DHI3
1	6.05	0.86	1.60	4.07	0.99	0.37	0.00	3.21	1.48	5.43	2.35	0.00	0.00	0.17	0.00	0.17
2	5.19	0.86	1.60	4.69	0.99	0.49	0.00	3.21	1.23	5.19	14.94	0.95	0.00	0.52	0.38	0.00
3	5.19	0.86	1.60	4.69	5.06	0.37	0.00	3.33	1.36	5.19	1.11	0.00	0.00	0.35	0.00	0.00
4	5.19	0.86	1.73	4.20	5.06	0.37	0.26	3.46	1.36	5.31	1.23	0.95	0.00	0.00	0.00	0.17
5	5.05	0.86	1.60	4.32	5.19	0.37	0.00	5.31	2.10	5.19	14.07	0.00	0.71	0.35	0.00	0.52
6	5.19	0.99	1.73	4.57	5.06	-	2.21	2.96	14.07	5.31	1.11	3.79	0.00	0.35	0.00	0.34
7	5.06	1.11	1.73	4.44	-	-	11.83	3.46	25.93	5.19	1.48	0.95	0.36	0.17	0.00	0.52
8	5.19	0.99	3.09	4.57	-	-	2.99	8.64	36.05	5.43	13.70	-	0.36	0.35	0.38	0.52
9	5.31	1.23	1.73	4.32	-	-	-	8.64	1.11	5.19	2.59	-	0.00	0.52	0.38	0.34
10	5.56	1.11	1.48	4.44	-	-	-	3.21	0.86	5.31	2.35	-	0.00	0.17	0.38	0.17
11	5.19	1.11	1.48	4.44	-	-	-	14.94	1.11	-	2.47	-	0.00	1.22	0.38	0.69
12	5.06	1.11	1.73	4.44	-	-	-	12.72	0.99	-	15.19	-	0.36	1.57	0.77	6.37
13	5.19	1.11	2.22	4.32	-	-	-	12.22	1.11	-	-	-	-	0.35	0.77	0.17
14	5.06	1.11	2.10	4.94	-	-	-	12.22	1.23	-	-	-	-	0.35	0.38	0.69
15	5.06	1.48	1.98	4.54	-	-	-	12.59	-	-	-	-	-	0.35	0.38	0.34
16	8.77	1.48	2.10	4.69	-	-	-	12.47	-	-	-	-	-	0.17	0.38	0.17
17	-	1.60	1.98	4.81	-	-	-	12.35	-	-	-	-	-	0.17	0.38	0.52
18	-	1.73	2.10	4.81	-	-	-	12.22	-	-	-	-	-	0.17	0.38	0.69
19	-	1.60	2.22	4.69	-	-	-	12.35	-	-	-	-	-	0.52	0.38	1.38
20	-	1.98	2.22	4.81	-	-	-	12.35	-	-	-	-	-	0.70	0.38	6.71
21	-	-	2.10	4.69	-	-	-	12.22	-	-	-	-	-	1.57	1.15	0.34
22	-	-	2.59	4.69	-	-	-	12.10	-	-	-	-	-	6.62	0.38	0.34
23	-	-	2.10	4.69	-	-	-	4.32	-	-	-	-	-	6.79	0.38	0.52
24	-	-	2.10	4.69	-	-	-	3.83	-	-	-	-	-	0.87	0.77	0.86
25	-	-	2.10	4.69	-	-	-	4.07	-	-	-	-	-	1.05	2.68	0.52
26	-	-	2.10	4.69	-	-	-	3.83	-	-	-	-	-	3.65	0.38	0.34
27	-	-	2.10	-	-	-	-	3.95	-	-	-	-	-	-	0.38	0.34
28	-	-	2.10	-	-	-	-	4.07	-	-	-	-	-	-	-	2.75
29	-	-	2.47	-	-	-	-	6.17	-	-	-	-	-	-	-	-
30	-	-	2.22	-	-	-	-	6.79	-	-	-	-	-	-	-	-
31	-	-	2.22	-	-	-	-	8.27	-	-	-	-	-	-	-	-
32	-	-	2.10	-	-	-	-	8.27	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	7.65	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	6.54	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	5.56	-	-	-	-	-	-	-	-
36	-	-	-	-	-	-	-	10.62	-	-	-	-	-	-	-	-
37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

XHA3 - Nerve Agent Antidote
DHC4 - Measure Azimuth with Compass
DHI2 - Use Visual Signals
DHIA - Boresight Tel.-DAP (M110)

XHB3 - Load/Reduce/Clear M16
DHC5 - Measure Azimuth with Protractor
DHI4 - Emplace Aiming Posts
DHI7 - Lay Howitzer (M109, M110)

XHB6 - Cal .50 Headspace/Timing
XHD1 - Put on M17 Mask
DHI3 - Collimator (M109, M110)
DHJ4 - Breech Mech. (M110)

DHB7 - Cal .50 Operator Maintenance
DHE3 - Install Field Telephone
DHIB - Sight on Target (M110)
XHD3 - Put on/Wear MOPP

Table B-4

LVI Hands On - 138 (Track M198) Amount of Data Missing by Task and Step (percent)

Step	XHA3	XHB3	XHB6	DHB7	DHC4	DHC5	XHD1	XHD3	DHE3	DHI2	DHI4	DHIJ	DHIL	DHIM	DHIN	DHJ6
1	6.05	0.86	1.60	4.07	0.99	0.37	0.00	3.21	1.48	5.43	2.35	0.00	0.00	0.46	0.46	0.00
2	5.19	0.86	1.60	4.69	0.99	0.49	0.00	3.21	1.23	5.19	14.94	0.45	0.46	0.00	0.00	2.48
3	5.19	0.86	1.60	4.69	5.06	0.37	0.00	3.33	1.36	5.19	1.11	0.00	0.46	0.00	0.00	0.00
4	5.19	0.86	1.73	4.20	5.06	0.37	0.26	3.46	1.36	5.31	1.23	0.00	0.00	0.00	0.00	0.00
5	5.06	0.86	1.60	4.32	5.19	0.37	0.00	5.31	2.10	5.19	14.07	0.91	0.00	0.00	0.00	0.00
6	5.19	0.99	1.73	4.57	5.06	-	2.21	2.96	14.07	5.31	1.11	0.45	0.00	0.00	0.00	0.50
7	5.06	1.11	1.73	4.44	-	-	11.93	3.46	25.93	5.19	1.48	0.45	0.46	0.00	0.00	0.00
8	5.19	0.99	3.09	4.57	-	-	2.99	8.64	36.05	5.43	13.70	0.00	0.00	0.00	-	0.00
9	5.31	1.23	1.73	4.32	-	-	-	8.64	1.11	5.19	2.59	0.45	0.00	0.00	-	0.00
10	5.56	1.11	1.48	4.44	-	-	-	3.21	0.86	5.31	2.35	0.00	0.00	-	-	0.00
11	5.19	1.11	1.48	4.44	-	-	-	14.94	1.11	-	2.47	0.45	0.00	-	-	0.00
12	5.05	1.11	1.73	4.44	-	-	-	12.72	0.99	-	15.19	0.00	0.00	-	-	0.00
13	5.19	1.11	2.22	4.32	-	-	-	12.22	1.11	-	-	0.00	14.61	-	-	0.50
14	5.06	1.11	2.10	4.94	-	-	-	12.22	1.23	-	-	0.45	5.02	-	-	2.48
15	5.06	1.48	1.98	4.94	-	-	-	12.59	-	-	-	0.00	5.02	-	-	0.00
16	8.77	1.48	2.10	4.69	-	-	-	12.47	-	-	-	0.45	5.02	-	-	0.50
17	-	1.60	1.98	4.81	-	-	-	12.35	-	-	-	0.45	5.02	-	-	0.50
18	-	1.73	2.10	4.81	-	-	-	12.22	-	-	-	0.45	5.02	-	-	0.00
19	-	1.60	2.22	4.69	-	-	-	12.35	-	-	-	0.45	7.76	-	-	0.00
20	-	1.98	2.22	4.81	-	-	-	12.35	-	-	-	1.36	7.76	-	-	0.00
21	-	-	2.10	4.69	-	-	-	12.22	-	-	-	1.36	7.76	-	-	0.00
22	-	-	2.59	4.69	-	-	-	12.10	-	-	-	1.36	7.76	-	-	100.00
23	-	-	2.10	4.69	-	-	-	4.32	-	-	-	1.36	7.76	-	-	0.50
24	-	-	2.10	4.69	-	-	-	3.83	-	-	-	1.36	0.46	-	-	0.00
25	-	-	2.10	4.69	-	-	-	4.07	-	-	-	1.36	0.00	-	-	0.00
26	-	-	2.10	4.69	-	-	-	3.83	-	-	-	1.82	0.46	-	-	-
27	-	-	2.10	-	-	-	-	3.95	-	-	-	-	0.00	-	-	-
28	-	-	2.10	-	-	-	-	4.07	-	-	-	-	0.00	-	-	-
29	-	-	2.47	-	-	-	-	6.17	-	-	-	-	0.00	-	-	-
30	-	-	2.22	-	-	-	-	6.79	-	-	-	-	-	-	-	-
31	-	-	2.22	-	-	-	-	8.27	-	-	-	-	-	-	-	-
32	-	-	2.10	-	-	-	-	8.27	-	-	-	-	-	-	-	-
33	-	-	-	-	-	-	-	7.65	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	6.54	-	-	-	-	-	-	-	-
35	-	-	-	-	-	-	-	5.56	-	-	-	-	-	-	-	-
36	-	-	-	-	-	-	-	10.62	-	-	-	-	-	-	-	-
37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

XHA3 - Nerve Agent Antidote
XHB3 - Load/Reduce/Clear M16
XHB6 - Cal .50 Headspace Timing
DHB7 - Cal .50 Operator Maintenance
DHC4 - Measure Azimuth with Compass
DHC5 - Measure Azimuth with Protractor
XHD1 - Put on M17 Mask
DHE3 - Install Field Telephone
DHI2 - Use Visual Signals
DHI4 - Emplace Aiming Posts
DHIJ - Collimator (M198)
DHIL - Lay Howitzer (M198)
DHIM - Boresight Tel.-DAP (M198)
DHIN - Sight on Target (M198)
DHJ6 - Breech Mech (M198)
XHD3 - Put on/Wear MOPP

Table B-5

LVI Hands On - 19E Amount of Data Missing by Task and Step (percent)

Step	XHA4	EHBC	XHC2	EHD7	EHE8	EHE6	XHE7	EHH1	EHH3	EHJ1	EHJ2	EHK1	XHK5	EHL1	EHL2
1	0.00	0.81	0.00	11.34	0.40	0.00	0.00	1.21	0.00	2.02	2.02	1.21	0.00	1.62	1.21
2	0.00	0.40	0.00	11.34	0.40	0.00	0.00	1.21	0.00	3.24	2.43	1.21	0.00	1.62	1.21
3	0.00	0.81	0.81	12.15	0.40	0.00	0.00	1.21	0.00	2.02	2.02	1.21	0.00	1.62	1.21
4	0.00	0.00	0.40	11.34	0.40	0.81	0.00	1.21	0.81	2.02	8.10	1.21	0.00	1.62	1.21
5	0.00	0.81	0.00	11.34	0.40	0.00	0.00	1.21	0.00	10.12	2.02	1.21	0.00	1.62	2.02
6	0.00	2.02	0.00	11.34	0.40	0.00	0.00	1.21	0.00	-	2.02	1.21	0.00	1.62	1.21
7	0.00	0.40	0.00	18.22	0.40	-	1.21	1.62	0.00	-	-	1.21	0.00	1.62	1.62
8	0.00	0.40	0.00	11.74	0.40	-	-	1.62	-	-	-	-	0.40	1.62	1.21
9	0.00	0.81	0.00	11.74	-	-	-	1.62	-	-	-	-	0.00	1.62	1.21
10	0.00	0.40	0.00	12.15	-	-	-	-	-	-	-	-	0.00	1.62	1.21
11	0.00	0.81	-	11.74	-	-	-	-	-	-	-	-	0.00	1.62	1.21
12	0.00	0.40	-	11.74	-	-	-	-	-	-	-	-	0.40	1.62	1.21
13	0.00	0.40	-	-	-	-	-	-	-	-	-	-	0.00	1.62	1.21
14	0.00	0.40	-	-	-	-	-	-	-	-	-	-	0.40	1.62	-
15	0.40	0.40	-	-	-	-	-	-	-	-	-	-	0.00	1.62	-
16	-	0.40	-	-	-	-	-	-	-	-	-	-	0.00	2.43	-
17	-	0.40	-	-	-	-	-	-	-	-	-	-	0.00	1.62	-
18	-	0.81	-	-	-	-	-	-	-	-	-	-	0.00	1.62	-
19	-	0.81	-	-	-	-	-	-	-	-	-	-	0.00	1.62	-
20	-	0.81	-	-	-	-	-	-	-	-	-	-	0.00	1.62	-
21	-	0.40	-	-	-	-	-	-	-	-	-	-	0.00	2.43	-
22	-	0.40	-	-	-	-	-	-	-	-	-	-	0.00	1.62	-
23	-	0.40	-	-	-	-	-	-	-	-	-	-	0.00	1.62	-
24	-	0.81	-	-	-	-	-	-	-	-	-	-	0.00	1.62	-
25	-	0.00	-	-	-	-	-	-	-	-	-	-	0.00	1.62	-
26	-	0.00	-	-	-	-	-	-	-	-	-	-	0.00	1.62	-
27	-	0.00	-	-	-	-	-	-	-	-	-	-	0.00	1.62	-
28	-	0.00	-	-	-	-	-	-	-	-	-	-	0.00	1.62	-
29	-	0.00	-	-	-	-	-	-	-	-	-	-	0.00	1.62	-
30	-	0.00	-	-	-	-	-	-	-	-	-	-	0.00	1.62	-
31	-	0.00	-	-	-	-	-	-	-	-	-	-	0.00	-	-
32	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-
33	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-
34	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-
35	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-
36	-	-	-	-	-	-	-	-	-	-	-	-	0.00	-	-

XHA4 - Put on Field Dressing
EHE8 - Operate Radio
EHH3 - Install Track Blocks
XHK5 - M240 Operator Maintenance
EHBC - M3A1 Operator Maintenance
EHE6 - Use Automated CEOI
EHJ1 - Gas Particulate Filter
EHL1 - Prepare Loader's Stations
XHC2 - Grid Coordinates
XHE7 - Send Radio Message
EHJ2 - Escape From Tank
EHL2 - Prepare-to-Fire Checks
EHD7 - Put on M17 Mask
EHH1 - Stop/Start Tank Engine
EHK1 - Boresight M60A3 Tank

Table B-6

LV1 Hands On - 19K Amount of Data Missing by Task and Step (percent)

Step	XHA4	XHBE	JHBF	XHC2	XHO3	XHE7	JHMB	JHJ1	JHK6	JHK8	XHK5	JHM5	JHM6	JHN5	JHBO
1	3.50	0.00	10.55	1.37	4.87	2.50	4.49	3.00	3.37	3.50	1.50	1.62	2.50	3.62	5.99
2	3.50	0.00	0.00	1.50	4.49	2.50	4.62	2.75	4.87	3.50	1.50	1.25	2.37	3.75	5.87
3	4.74	0.00	0.00	1.25	4.74	2.87	4.49	2.75	3.37	3.50	1.50	1.37	2.37	3.62	5.87
4	3.75	0.00	0.29	1.25	5.24	2.50	4.49	3.12	3.37	3.50	1.62	1.37	2.37	3.87	5.99
5	4.12	0.00	0.14	1.25	6.87	2.50	4.49	2.75	3.50	3.50	1.50	1.37	2.37	4.24	6.12
6	4.24	0.00	0.14	1.37	4.49	2.50	4.49	2.87	3.50	3.50	1.50	1.37	2.37	3.75	5.87
7	3.50	0.00	0.29	1.62	4.99	3.87	4.49	-	3.37	4.12	1.50	2.62	2.37	4.12	5.87
8	4.00	0.00	0.29	1.37	4.87	-	4.49	-	3.37	9.61	1.75	1.75	2.37	-	5.87
9	4.00	49.37	0.29	1.87	4.87	-	4.62	-	3.37	-	1.62	2.25	2.37	-	5.99
10	4.12	49.37	0.29	1.37	5.24	-	4.87	-	3.37	-	1.62	1.25	-	-	5.87
11	6.24	49.37	0.14	-	6.87	-	4.49	-	3.37	-	1.62	1.62	-	-	5.99
12	3.62	1.27	0.00	-	6.37	-	4.99	-	3.37	-	1.62	1.50	-	-	5.87
13	3.87	1.27	0.29	-	6.49	-	5.12	-	3.50	-	1.50	-	-	-	5.87
14	3.62	1.27	0.43	-	6.74	-	-	-	-	-	1.50	-	-	-	5.99
15	3.87	0.00	0.58	-	6.62	-	-	-	-	-	1.87	-	-	-	6.12
16	-	0.00	-	-	6.49	-	-	-	-	-	1.50	-	-	-	5.99
17	-	0.00	-	-	6.37	-	-	-	-	-	1.50	-	-	-	6.12
18	-	49.37	-	-	6.49	-	-	-	-	-	1.75	-	-	-	6.12
19	-	49.37	-	-	6.49	-	-	-	-	-	1.50	-	-	-	5.87
20	-	49.37	-	-	6.49	-	-	-	-	-	1.50	-	-	-	5.87
21	-	50.63	-	-	6.49	-	-	-	-	-	1.62	-	-	-	5.87
22	-	49.37	-	-	6.37	-	-	-	-	-	2.00	-	-	-	5.67
23	-	1.27	-	-	4.74	-	-	-	-	-	1.62	-	-	-	5.99
24	-	50.63	-	-	4.74	-	-	-	-	-	1.75	-	-	-	5.99
25	-	0.00	-	-	4.74	-	-	-	-	-	1.75	-	-	-	5.87
26	-	0.00	-	-	4.62	-	-	-	-	-	1.87	-	-	-	6.12
27	-	2.53	-	-	4.62	-	-	-	-	-	1.75	-	-	-	6.24
28	-	0.00	-	-	4.62	-	-	-	-	-	1.62	-	-	-	-
29	-	0.00	-	-	32.96	-	-	-	-	-	1.75	-	-	-	-
30	-	0.00	-	-	33.08	-	-	-	-	-	1.62	-	-	-	-
31	-	0.00	-	-	37.20	-	-	-	-	-	1.75	-	-	-	-
32	-	0.00	-	-	36.95	-	-	-	-	-	1.75	-	-	-	-
33	-	-	-	-	20.22	-	-	-	-	-	2.12	-	-	-	-
34	-	-	-	-	20.22	-	-	-	-	-	1.87	-	-	-	-
35	-	-	-	-	17.75	-	-	-	-	-	2.12	-	-	-	-
36	-	-	-	-	25.09	-	-	-	-	-	1.87	-	-	-	-

XHA4 - Put on Field Dressing
XHO3 - Put on/Wear MOPP
JHK6 - Operate Ammo Doors Manually
JHBO - Cal .50 Operator Maintenance
XHBE - M9 Operator Maintenance
XHE7 - Send Radio Message
XHK5 - M240 Operators Maintenance
JHK8 - Boresight M1 Tank
JHBF - Cal .45 Operator Maintenance
JHMB - Install/Operate AN/VVS-2
JHM6 - Visual Signals
JHM5 - Prepare Driver's Station
XHC2 - Grid Coordinates
JHJ1 - Establish Radio Net/CEOI
JHN5 - Perform PMCS on M1 Tank

Table B-7

(V) Hands On - 31C Amount of Data Missing by Task and Step (percent)

Step	XIA4	XHB3	XHC2	XHD3	GHH1	GHH2	GHH3	GHH4	GHI1	GHI3	GHI7	GHIA	GHJI
1	6.93	8.51	7.72	8.32	0.00	8.71	9.90	0.28	12.28	17.03	11.49	7.33	10.10
2	7.13	8.51	7.72	8.32	0.00	10.89	9.90	0.28	15.05	17.03	11.29	7.33	9.70
3	7.13	8.51	8.12	8.32	0.00	13.66	9.31	0.55	12.48	17.03	11.49	8.32	9.70
4	6.93	8.51	8.32	8.71	1.96	10.50	9.70	0.00	12.48	17.23	11.49	7.72	10.50
5	6.93	8.51	8.12	11.85	0.98	10.69	9.50	0.55	12.48	17.03	11.29	8.12	10.30
6	7.33	8.51	7.72	8.32	0.00	9.11	9.90	3.05	13.07	17.03	12.48	8.32	10.69
7	6.73	9.11	7.92	9.31	0.98	8.91	9.90	0.28	12.48	17.03	14.06	8.32	10.10
8	6.93	8.51	7.92	8.32	0.00	13.27	10.69	0.28	12.87	17.03	13.27	8.71	10.10
9	7.33	8.51	8.32	8.32	0.00	8.51	9.31	0.83	13.27	17.03	13.07	7.72	-
10	7.52	8.51	8.12	8.51	3.92	9.31	9.50	1.39	[illegible]	[illegible]	12.67	7.72	-
11	6.93	8.51	-	22.38	0.00	10.10	-	1.94	[illegible]	[illegible]	12.48	9.70	-
12	6.73	8.71	-	21.19	0.98	9.50	-	9.42	12.87	17.03	12.87	7.92	-
13	6.73	8.51	-	21.58	0.00	10.10	-	14.13	[illegible]	17.03	14.06	8.71	-
14	3.73	10.50	-	21.19	0.00	8.71	-	0.97	[illegible]	17.23	11.68	-	-
15	7.52	9.31	-	21.19	0.00	9.50	-	1.91	12.87	17.23	11.88	-	-
16	-	9.50	-	21.19	0.98	9.31	-	[illegible]	13.27	17.23	[illegible]	-	-
17	-	9.31	-	21.39	0.00	[illegible]	-	0.28	15.63	17.23	[illegible]	-	-
18	-	9.31	-	21.19	0.00	[illegible]	-	0.28	[illegible]	17.23	12.28	-	-
19	-	9.31	-	21.39	0.00	9.70	-	0.55	13.27	[illegible]	11.98	-	-
20	-	9.50	-	21.39	0.00	10.50	-	1.39	[illegible]	19.21	12.08	-	-
21	-	-	-	21.19	0.00	9.50	-	[illegible]	13.07	19.60	-	-	-
22	-	-	-	21.39	0.00	9.31	-	[illegible]	12.46	19.21	-	-	-
23	-	-	-	8.51	0.98	9.70	-	9.14	12.46	19.21	-	-	-
24	-	-	-	8.91	0.00	8.91	-	[illegible]	14.99	19.41	-	-	-
25	-	-	-	9.31	82.35	9.11	-	[illegible]	15.84	19.41	-	-	-
26	-	-	-	8.91	-	9.21	-	0.55	12.46	20.00		-	-
27		-	-	8.91	-	9.11		1.39	12.48	21.40	-	-	-
28	-	-	-	8.51	-	9.11		0.28	12.67	19.80	-	-	-
29	-	-	-	39.41	-	9.11	-	0.28	12.57	19.80	-	-	-
30	-	-	-	35.45			-	0.28	12.40	19.60	-	-	-
31	-	-	-	[illegible]	-	-	-	0.55	12.67	20.99	-	-	-
32	-	-	-	39.60			-	0.55	12.67	20.59	-	-	-
33	-	-	-	39.60	-	-	-	[illegible]	13.27	21.70	-	-	-
34	-	-	-	36.83	-	-	-	-	12.40	[illegible]	-	-	-
35	-	-	-	15.75	-	-	-	-	12.48	21.98	-	-	-
36	-	-	-	[illegible]		-	-	-	13.27	22.18	-	-	-
37	-	-	-			-	-	-	12.28	22.36	-	-	-
38	-	-	-		-	-	-	-	12.28	22.39	-	-	-
39	-	-	-	-	-	-	-	-	12.28	22.18	-	-	-
40	-	-	-	-	-	-	-	-	12.28	22.38	-	-	-
41		-	-	-	-	-	-		12.28	22.38	-	-	-
42		-	-	-	-	-	-	-	12.28	22.38	-	-	-
43	-	-	-	-	-	-	-	-	12.28	22.57	-	-	-
44	-	-	-	-	-	-	-	-	12.28	22.57	-	-	-
45	-	-	-	-	-	-	-	-	12.28	22.58	-	-	-
46	-	-	-	-	-	-	-	-	12.40	[illegible]	-	-	-

Table B-7 (cont'd.)

LV1 Hands On - 31C Amount of Data Missing by Task and Step (percent)

Step	XHA4	XHB3	XHC2	XHD1	GHH1	GHH2	GHH3	GHH4	GHI1	GHI3	GHI7	GHIA	GHJ1
47	-	-	-	-	-	-	-	-	12.28	22.57	-	-	-
48	-	-	-	-	-	-	-	-	13.07	22.57	-	-	-
49	-	-	-	-	-	-	-	-	13.47	22.97	-	-	-
50	-	-	-	-	-	-	-	-	18.61	23.17	-	-	-
51	-	-	-	-	-	-	-	-	18.21	-	-	-	-
52	-	-	-	-	-	-	-	-	18.42	-	-	-	-
53	-	-	-	-	-	-	-	-	18.42	-	-	-	-
54	-	-	-	-	-	-	-	-	18.61	-	-	-	-
55	-	-	-	-	-	-	-	-	18.61	-	-	-	-
56	-	-	-	-	-	-	-	-	18.42	-	-	-	-
57	-	-	-	-	-	-	-	-	18.61	-	-	-	-
58	-	-	-	-	-	-	-	-	19.21	-	-	-	-
59	-	-	-	-	-	-	-	-	96.04	-	-	-	-
60	-	-	-	-	-	-	-	-	96.74	-	-	-	-
61	-	-	-	-	-	-	-	-	37.82	-	-	-	-
62	-	-	-	-	-	-	-	-	23.56	-	-	-	-
63	-	-	-	-	-	-	-	-	23.50	-	-	-	-
64	-	-	-	-	-	-	-	-	15.45	-	-	-	-
65	-	-	-	-	-	-	-	-	13.86	-	-	-	-
66	-	-	-	-	-	-	-	-	12.48	-	-	-	-
67	-	-	-	-	-	-	-	-	13.07	-	-	-	-
68	-	-	-	-	-	-	-	-	12.48	-	-	-	-
69	-	-	-	-	-	-	-	-	12.48	-	-	-	-
70	-	-	-	-	-	-	-	-	12.48	-	-	-	-
71	-	-	-	-	-	-	-	-	12.48	-	-	-	-
72	-	-	-	-	-	-	-	-	13.86	-	-	-	-
73	-	-	-	-	-	-	-	-	14.65	-	-	-	-

XHA4 - Put on Field Dressing
XHB3 - Load/Reduce/Clear
XHC2 - Grid Coordinates
XHD1 - Put on/Wear MOPP
GHH1 - PMCS on M884 Truck
GHH2 - Operate Generator PU-620
GHH3 - Troubleshoot PU-620
GHH4 - PMCS on M1028 Truck
GHI1 - Operate TTY GRC-142
GHI3 - Operate Terminal UGC-74
GHI7 - Install Radio GRC-106
GHIA - Install TTY GRC-142
GHJ1 - Establish Radio Net/CEOI
GHJ3 - Use KTC 1400 Cipher
GHJ4 - Message in 16-line Format
GHJ6 - Recognize ECM

Table B-6

LV1 Hands On - 63B Amount of Missing Data by Task and Step (percent)

Step	XHA4	XHB3	XHC1	XHD1	HHG5	HHH1	HHI1	HHJ1	HHJ2	HHM2	HHM3	HHN1	HHN3
1	3.21	2.37	.14	49.02	3.35	22.07	9.50	23.04	7.26	18.16	8.94	16.34	22.91
2	3.35	2.51	.28	49.02	3.21	15.92	10.20	22.77	7.26	18.16	8.94	16.34	23.18
3	3.21	2.51	.26	48.88	3.21	16.20	9.64	22.77	7.26	18.16	8.94	41.34	23.04
4	[illegible]	2.79	.42	49.44	3.21	16.06	9.50	23.18	7.96	18.30	8.94	25.70	23.60
5	[illegible]	2.93	-	49.02	3.35	16.34	21.09	23.04	-	18.16	9.08	41.48	23.46
6	[illegible]	2.93	-	49.02	3.49	19.69	21.23	23.60	-	18.30	-	45.39	23.60
7	[illegible]	3.21	-	49.72	3.35	16.06	6.28	24.58	-	19.13	-	16.76	25.42
8	3.35	2.23	-	50.14	3.21	16.20	6.15	23.18	-	18.16	-	17.18	23.32
9	3.77	2.23	-	-	3.91	16.06	6.42	23.18	-	18.16	-	17.60	23.32
10	4.05	2.23	-	-	3.63	16.06	5.15	23.32	-	18.30	-	16.48	23.32
11	3.21	2.51	-	-	3.35	16.20	6.56	24.44	-	18.30	-	16.62	23.32
12	3.21	2.23	-	-	3.77	16.34	-	23.46	-	18.30	-	16.90	31.84
13	3.21	2.23	-	-	-	-	-	23.04	-	18.44	-	41.48	24.44
14	3.21	2.37	-	-	-	-	-	23.04	-	-	-	16.62	-
15	3.63	2.09	-	-	-	-	-	23.04	-	-	-	50.14	-
16	-	2.09	-	-	-	-	-	23.18	-	-	-	36.17	-
17	-	2.09	-	-	-	-	-	23.46	-	-	-	16.76	-
18	-	2.23	-	-	-	-	-	-	-	-	-	-	-
19	-	2.09	-	-	-	-	-	-	-	-	-	-	-
20	-	2.09	-	-	-	-	-	-	-	-	-	-	-

XHA4 - Put on Field Dressing
HHG5 - Use Challenge and Password
HHJ2 - Repair Electrical Wiring
HHN3 - Troubleshoot Fuel System
XHB3 - Load/Reduce/Clear M16
HHH1 - Replace Wheel Bearings
HHM2 - Repair Air Hydraulic Cylinder
XHC1 - Measure Azimuth with Compass
HHI1 - Maintain Tool Kit
HHM3 - Troubleshoot Service Brake
XHD1 - Put on/Wear M17 Mask
HHJ1 - Troubleshoot Electrical System
HHN1 - Replace Fuel Pump

Table B-9

LVI Hands On - 71L Amount of Data Missing by Task and Step (percent)

Step	XHA4	XHB4	XHC2	XHD1	AHH1	AHH3	AHJ2	AHJ3	AHJ4	AHJ6	AHJ7	AHK2
1	1.34	10.68	1.79	26.93	6.85	6.85	4.46	12.35	4.91	4.61	4.17	1.93
2	1.34	4.17	1.93	26.93	7.29	7.14	4.46	4.91	5.06	4.61	4.17	1.79
3	1.79	4.17	1.93	26.93	-	6.85	4.46	5.65	6.40	4.61	4.46	2.23
4	1.64	4.32	1.93	26.93	-	6.85	4.91	4.61	5.36	4.61	4.32	2.23
5	1.79	4.17	1.93	27.38	-	6.99	4.61	4.76	5.06	5.06	4.32	2.23
6	1.34	4.02	1.93	26.93	-	6.85	4.91	4.76	5.51	4.61	4.17	2.23
7	1.34	5.06	1.93	27.68	-	6.99	4.76	4.76	5.21	4.61	4.32	11.90
8	1.49	6.85	2.23	28.42	-	6.85	36.31	4.76	23.36	4.76	4.32	10.57
9	1.34	4.32	2.08	-	-	-	4.91	36.31	5.06	4.76	4.17	10.86
10	1.49	4.02	1.79	-	-	-	4.46	5.06	5.36	4.91	5.80	10.57
11	1.34	4.02	-	-	-	-	-	4.76	5.36	4.91	5.36	10.57
12	1.34	4.02	-	-	-	-	-	-	5.36	-	5.65	10.71
13	1.34	4.02	-	-	-	-	-	-	5.51	-	12.80	-
14	1.34	4.17	-	-	-	-	-	-	5.51	-	-	-
15	1.93	4.17	-	-	-	-	-	-	6.10	-	-	-
16	-	6.40	-	-	-	-	-	-	6.25	-	-	-
17	-	3.87	-	-	-	-	-	-	6.25	-	-	-
18	-	4.17	-	-	-	-	-	-	6.70	-	-	-
19	-	13.39	-	-	-	-	-	-	-	-	-	-
20	-	13.54	-	-	-	-	-	-	-	-	-	-
21	-	4.32	-	-	-	-	-	-	-	-	-	-
22	-	4.02	-	-	-	-	-	-	-	-	-	-
23	-	4.32	-	-	-	-	-	-	-	-	-	-
24	-	4.02	-	-	-	-	-	-	-	-	-	-
25	-	4.02	-	-	-	-	-	-	-	-	-	-
26	-	4.17	-	-	-	-	-	-	-	-	-	-
27	-	4.17	-	-	-	-	-	-	-	-	-	-
28	-	4.91	-	-	-	-	-	-	-	-	-	-
29	-	4.46	-	-	-	-	-	-	-	-	-	-
30	-	5.80	-	-	-	-	-	-	-	-	-	-
31	-	13.10	-	-	-	-	-	-	-	-	-	-
32	-	13.54	-	-	-	-	-	-	-	-	-	-
33	-	5.65	-	-	-	-	-	-	-	-	-	-
34	-	6.10	-	-	-	-	-	-	-	-	-	-
35	-	6.99	-	-	-	-	-	-	-	-	-	-
36	-	7.29	-	-	-	-	-	-	-	-	-	-
37	-	8.04	-	-	-	-	-	-	-	-	-	-
38	-	7.89	-	-	-	-	-	-	-	-	-	-
39	-	7.74	-	-	-	-	-	-	-	-	-	-
40	-	7.74	-	-	-	-	-	-	-	-	-	-
41	-	8.04	-	-	-	-	-	-	-	-	-	-
42	-	7.99	-	-	-	-	-	-	-	-	-	-
43	-	8.33	-	-	-	-	-	-	-	-	-	-

XHA4 - Put on Field Dressing
AHH1 - File Documents
AHJ4 - Type Joint Messageform
XHB4 - M16 Operator Maintenance
AHH3 - Request Forms-DA 4569
AHJ6 - Type Memorandum
XHC2 - Grid Coordinates
AHJ2 - Type Military Orders
AHJ7 - Type Basic Comment to DF
XHD1 - Put on/Wear M17 Mask
AHJ3 - Type Second Comment to DF
AHK2 - Receipt Classified Mat.

AHJ5 - Type Straight Copy not imputed at step level.

Table B-10

LVI Hands On - 88M Aaount of : a Missing by Task and Step (percent)

Step	XHA1	XHA3	XHA4	XHB3	XHB4	XHB5	XHC2	XHD1	XHD3	CHC3	CHD5	CHD6	CHH3	CHH4	CHH5
1	6.51	2.12	1.66	4.08	5.14	16.49	2.57	26.93	13.46	3.03	5.14	3.63	15.73	15.58	15.89
2	6.51	1.36	1.66	4.24	4.08	16.19	2.57	26.93	13.77	3.18	5.30	3.63	14.67	15.13	17.10
3	7.11	1.51	1.51	4.39	4.08	16.19	2.57	26.93	13.31	3.18	5.45	14.52	14.52	15.13	94.25
4	3.03	1.36	1.51	4.24	4.54	17.25	2.72	26.93	13.92	-	5.75	3.63	14.67	15.58	94.25
5	3.03	1.36	2.27	4.54	4.24	16.19	2.87	26.93	15.73	-	6.05	5.14	14.52	17.10	15.79
6	23.90	1.51	1.97	4.08	4.39	16.64	3.48	26.93	13.31	-	5.90	16.79	14.52	15.13	16.04
7	3.03	1.36	1.51	4.69	4.54	20.12	3.33	29.65	15.43	-	16.04	-	14.52	16.19	16.19
8	3.03	1.66	2.27	3.78	4.84	20.12	3.63	27.38	14.07	-	-	-	14.98	92.89	16.34
9	3.03	1.36	2.42	3.93	3.93	16.19	3.48	-	14.22	-	-	-	14.89	14.98	16.34
10	24.96	1.66	2.72	3.78	3.93	16.49	3.18	-	13.92	-	-	-	15.58	14.98	-
11	3.33	1.36	1.51	3.93	3.93	16.49	-	-	15.69	-	-	-	15.43	14.98	-
12	3.18	1.36	1.51	3.93	3.93	16.49	-	-	14.37	-	-	-	15.58	15.58	-
13	3.18	1.36	2.27	4.24	3.93	16.64	-	-	14.67	-	-	-	15.13	17.55	-
14	3.33	1.36	1.82	5.14	3.93	16.49	-	-	14.52	-	-	-	15.13	-	-
15	3.33	1.51	3.48	5.14	3.93	16.49	-	-	14.52	-	-	-	15.28	-	-
16	3.33	1.82	-	5.30	7.56	16.49	-	-	14.52	-	-	-	14.98	-	-
17	3.48	-	-	5.14	4.24	16.79	-	-	14.67	-	-	-	14.83	-	-
18	-	-	-	5.14	4.24	16.94	-	-	14.07	-	-	-	15.73	-	-
19	-	-	-	5.14	4.84	17.10	-	-	14.22	-	-	-	92.89	-	-
20	-	-	-	5.30	4.84	16.94	-	-	14.37	-	-	-	92.89	-	-
21	-	-	-	-	4.99	16.64	-	-	14.67	-	-	-	-	-	-
22	-	-	-	-	4.54	16.79	-	-	15.58	-	-	-	-	-	-
23	-	-	-	-	4.54	16.79	-	-	14.67	-	-	-	-	-	-
24	-	-	-	-	4.54	16.64	-	-	14.83	-	-	-	-	-	-
25	-	-	-	-	4.54	16.64	-	-	14.67	-	-	-	-	-	-
26	-	-	-	-	4.99	16.64	-	-	14.37	-	-	-	-	-	-
27	-	-	-	-	4.84	16.64	-	-	14.22	-	-	-	-	-	-
28	-	-	-	-	4.99	16.64	-	-	14.83	-	-	-	-	-	-
29	-	-	-	-	4.99	16.64	-	-	27.38	-	-	-	-	-	-
30	-	-	-	-	6.51	-	-	-	27.99	-	-	-	-	-	-
31	-	-	-	-	5.60	-	-	-	27.99	-	-	-	-	-	-
32	-	-	-	-	5.45	-	-	-	27.69	-	-	-	-	-	-
33	-	-	-	-	4.84	-	-	-	23.30	-	-	-	-	-	-
34	-	-	-	-	4.69	-	-	-	20.42	-	-	-	-	-	-
35	-	-	-	-	4.84	-	-	-	17.10	-	-	-	-	-	-
36	-	-	-	-	4.99	-	-	-	22.09	-	-	-	-	-	-
37	-	-	-	-	4.84	-	-	-	-	-	-	-	-	-	-
38	-	-	-	-	4.84	-	-	-	-	-	-	-	-	-	-
39	-	-	-	-	5.14	-	-	-	-	-	-	-	-	-	-
40	-	-	-	-	4.84	-	-	-	-	-	-	-	-	-	-
41	-	-	-	-	4.84	-	-	-	-	-	-	-	-	-	-
42	-	-	-	-	4.99	-	-	-	-	-	-	-	-	-	-
43	-	-	-	-	4.84	-	-	-	-	-	-	-	-	-	-

XHA1 - Buddy-Aid
XHB4 - M16 Operator Maintenance
XHD3 - Put on/Wear MOPP
CHH3 - Couple Semitrailer
XHA3 - Nerve Agent Antidote
XHB5 - Load/Reduce/Clear M60
CHC3 - Measure Distance on Map
CHH4 - Uncouple Semitrailer
XHA4 - Put Field Dressing
XHC2 - Grid Coordinates
CHD5 - Decontaminate Equipment
CHH5 - Operate Tractor & Trailer
XHB3 - Load/Reduce/Clear M16
XHD1 - Put on/Wear M17 Mask
CHD6 - ID Chemical Agent

Table B-11

LVI Hands On - 91A Amount of Data Missing by Task and Step (percent)

Step	XHA4	XHA2	IHA6	IHA9	IHA8	XHC2	IHI1	IHI5	IHI6	IHI9	IHI8	IHI7	IHI3
1	0.00	11.79	1.00	0.25	0.13	1.76	0.63	1.25	1.51	3.26	1.25	6.27	0.63
2	0.00	11.92	0.75	0.50	0.50	1.76	1.38	1.38	1.63	3.26	1.00	3.76	0.38
3	0.38	12.05	0.75	0.25	0.88	1.76	0.75	1.13	0.88	7.53	0.75	3.64	0.75
4	0.00	12.05	0.63	0.50	0.00	1.76	0.75	1.25	0.63	3.51	1.13	4.39	1.00
5	1.25	12.42	0.88	0.25	1.13	2.01	0.75	2.13	1.38	3.51	0.88	4.39	1.38
6	0.13	11.79	0.38	0.25	0.00	1.88	0.63	1.25	1.00	3.39	1	4.27	1.76
7	0.00	12.17	0.50	0.50	1.38	1.88	0.63	1.13	0.75	3.39	1.00	4.02	4.89
8	0.13	12.67	0.38	0.38	0.00	2.01	0.63	1.00	0.38	3.64	1.00	3.51	-
9	0.50	11.79	0.38	0.63	0.13	2.01	2.26	1.00	0.38	3.64	1.25	3.64	-
10	0.63	11.92	0.50	0.38	0.13	2.01	2.38	1.13	0.50	4.77	0.88	3.89	-
11	0.25	11.67	-	0.38	-	-	1.63	1.38	0.75	-	1.00	3.64	-
12	0.25	11.79	-	0.38	-	-	1.63	1.76	1.76	-	0.88	3.64	-
13	0.25	12.17	-	0.25	-	-	0.63	1.76	1.38	-	1.00	3.76	-
14	0.38	12.55	-	0.50	-	-	2.13	-	1.38	-	1.38	3.51	-
15	1.51	12.30	-	0.38	-	-	1.25	-	0.88	-	3.14	4.39	-
16	-	12.05	-	0.38	-	-	1.13	-	10.66	-	-	5.14	-
17	-	12.55	-	0.25	-	-	1.00	-	10.66	-	-	4.27	-
18	-	12.80	-	-	-	-	1.25	-	1.00	-	-	4.39	-
19	-	12.05	-	-	-	-	1.13	-	3.26	-	-	-	-
20	-	12.05	-	-	-	-	1.88	-	0.63	-	-	-	-
21	-	55.71	-	-	-	-	1.00	-	0.88	-	-	-	-
22	-	12.05	-	-	-	-	1.13	-	0.63	-	-	-	-
23	-	12.42	-	-	-	-	1.76	-	0.75	-	-	-	-
24	-	12.30	-	-	-	-	1.63	-	1.25	-	-	-	-
25	-	12.05	-	-	-	-	1.63	-	-	-	-	-	-
26	-	12.42	-	-	-	-	1.38	-	-	-	-	-	-
27	-	12.57	-	-	-	-	2.51	-	-	-	-	-	-
28	-	12.67	-	-	-	-	0.88	-	-	-	-	-	-
29	-	-	-	-	-	-	0.88	-	-	-	-	-	-
30	-	-	-	-	-	-	1.51	-	-	-	-	-	-

XHA4 - Put on Field Dressing
IHA8 - Splint Suspected Fracture
IHI6 - Assemble Needle
IHI3 - Measure Pulse/Respirations
XHA2 - Perform CPR on Adult
XHC2 - Grid Coordinates
IHI9 - Sterile Field
IHA6 - Open Airway
IHI1 - Initiate IV Infusion
IHI8 - Administer Injection
IHA9 - Field Medical Card
IHI5 - Measure Blood Pressure
IHI7 - Change Sterile Dressing

Table B.12

LV1 Hands On - 95B Amount of Data Missing by Task and Step (percent)

Step	IMP4	BME1	BME2	IMB3	IMB5	IMBE	IMC2	BMC7	IMC1	IMD1	IMG8	BMP1	BMR3	BMR6	BMM1
1	0.00	0.00	2.70	0.67	0.90	0.00	0.22	0.67	0.45	15.73	37.30	2.25	0.00	0.22	2.02
2	0.00	0.00	2.70	0.67	0.90	0.00	0.22	0.67	0.45	15.73	37.30	2.25	0.22	0.45	0.90
3	0.45	0.00	2.70	0.90	0.90	0.00	0.45	1.12	0.22	15.73	42.37	2.25	0.22	0.22	0.67
4	0.00	0.00	2.70	0.67	1.57	0.90	0.45	-	0.22	15.73	37.75	10.79	0.22	0.45	0.90
5	0.45	0.00	5.41	0.67	1.57	0.00	0.45	-	-	15.73	37.75	16.79	0.22	0.45	0.67
6	0.90	0.00	0.00	0.67	1.35	1.81	0.22	-	-	21.12	-	14.79	0.22	0.45	0.45
7	0.22	0.00	0.00	1.12	1.12	0.00	0.22	-	-	22.92	-	2.25	0.22	0.90	2.47
8	0.90	0.00	0.00	0.45	1.12	0.90	0.45	-	-	21.12	-	2.25	0.22	0.67	0.45
9	0.67	0.00	0.00	0.45	1.12	4.23	1.12	-	-	-	-	8.99	0.22	0.67	0.90
10	1.12	0.00	0.00	0.45	1.12	4.23	0.45	-	-	-	-	2.72	0.22	0.27	4.72
11	0.45	0.00	0.00	0.67	1.17	4.23	-	-	-	-	-	2.25	0.45	0.22	9.45
12	0.22	0.62	0.00	0.67	1.12	0.00	-	-	-	-	-	2.47	0.22	0.22	1.12
13	0.22	0.31	-	0.67	1.12	0.00	-	-	-	-	-	3.82	0.22	0.22	0.45
14	0.22	0.31	-	5.17	1.12	0.00	-	-	-	-	-	3.15	0.22	0.45	0.67
15	1.12	0.31	-	0.67	1.35	0.00	-	-	-	-	-	2.47	0.22	0.22	0.90
16	-	0.31	-	0.90	1.12	0.00	-	-	-	-	-	3.82	0.00	0.67	-
17	-	0.31	-	0.67	1.57	0.90	-	-	-	-	-	2.25	0.00	0.45	-
18	-	0.31	-	0.67	1.12	4.23	-	-	-	-	-	3.37	0.00	0.22	-
19	-	0.90	-	0.67	1.12	4.23	-	-	-	-	-	9.21	0.00	0.90	-
20	-	0.00	-	0.67	1.57	4.23	-	-	-	-	-	10.56	0.00	0.90	-
21	-	0.00	-	-	1.57	4.23	-	-	-	-	-	8.99	0.45	-	-
22	-	0.00	-	-	1.12	0.00	-	-	-	-	-	17.53	0.00	-	-
23	-	0.00	-	-	1.35	0.00	-	-	-	-	-	-	0.00	-	-
24	-	0.00	-	-	1.35	0.00	-	-	-	-	-	-	0.22	-	-
25	-	0.00	-	-	1.12	0.00	-	-	-	-	-	-	0.22	-	-
26	-	0.31	-	-	1.35	0.00	-	-	-	-	-	-	0.00	-	-
27	-	1.25	-	-	1.12	0.00	-	-	-	-	-	-	0.00	-	-
28	-	0.22	-	-	1.57	0.00	-	-	-	-	-	-	0.00	-	-
29	-	0.31	-	-	1.80	0.00	-	-	-	-	-	-	0.00	-	-
30	-	0.31	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-
31	-	0.62	-	-	-	0.00	-	-	-	-	-	-	0.22	-	-
32	-	1.25	-	-	-	0.00	-	-	-	-	-	-	0.00	-	-
33	-	0.31	-	-	-	-	-	-	-	-	-	-	0.00	-	-
34	-	1.80	-	-	-	-	-	-	-	-	-	-	0.00	-	-
35	-	0.00	-	-	-	-	-	-	-	-	-	-	0.00	-	-
36	-	0.31	-	-	-	-	-	-	-	-	-	-	0.00	-	-
37	-	0.00	-	-	-	-	-	-	-	-	-	-	0.00	-	-
38	-	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
39	-	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-

IMP4 - Put on Field Dressing
BME1 - Operate/Maintenance .45 Pistol
BME2 - Operate/Maintenance .38 Revolver
IMB3 - Load/Reduce/Clear M16
IMB5 - Load/Reduce/Clear M60
IMBE - M8 Operator Maintenance
IMC2 - Grid Coordinates
BMC7 - Navigate on Ground
IMC1 - Determine Azimuth with Compass
IMD1 - Put on/Wear M17 Mask
IMG8 - Estimate Range
BMM1 - Perform PMCS (M998)
BMR3 - Prepare MP Reports
BMR6 - Direct Traffic
BMP1 - Operate Dismount Point

Appendix C

EXAMPLE OF THE REPORT ON IMPUTATION OF
STEP-LEVEL DATA
(HANDS-ON TASK IN MOS 71L)

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VERSION: 1D

RELEASED: APRIL 1989

C O N T E N T S

Input File: DHJ.DISK.I71LXHD1
Output File: RKU.IMP.I71LXHD1
TITLE VERSION IMPUTE.TEMP ON PROC.IMPUTE I71LXHD1
MISSING DATA REPORT #1: MISSING DATA FREQUENCIES AND UNIVARIATE STATISTICS

VARIABLE	N MISS	% MISS	N PRES	MIN	MAX	I/D	NV	MEAN	STD
M7XHTOTT	18	2.68	654	15.1730	93.0740	D	6	57.9161	12.3483
STEP01	181	26.93	491	0.	1.	I	2	0.989817	0.100397
STEP02	181	26.93	491	0.	1.	I	2	0.814664	0.388570
STEP03	181	26.93	491	0.	1.	I	2	0.802444	0.398155
STEP04	181	26.93	491	0.	1.	I	2	0.755601	0.429730
STEP05	184	27.38	488	0.	1.	I	2	0.555328	0.496929
STEP06	181	26.93	491	0.	1.	I	2	0.914460	0.279683
STEP07	186	27.68	486	0.	1.	I	2	0.753086	0.431216
STEP08	191	28.42	481	0.	1.	I	2	0.395010	0.488853

TITLE VERSION IMPUTE.TEMP ON PROC.IMPUTE I71LXHD1
MISSING DATA REPORT #2: CHARACTERISTICS OF CASES WITH MISSING VALUES (FOR EACH VARIABLE)

MISSING	S E C O N D	V A R I A B L E							
VARIABLE	M7XHTOTT	STEP01	STEP02	STEP03	STEP04	STEP05	STEP06	STEP07	STEP08
M7XHTOTT	57.9161	1.	0.500000	0.500000	0.500000	0.	1.	0.500000	0.
	12.3483	0.	0.500000	0.500000	0.500000	0.	0.	0.500000	0.
	654	2	2	2	2	2	2	2	1
	0.000	0.232	0.232	0.232	0.232	0.229	0.232	0.227	0.243
	0.000	0.144	-1.154	-1.082	-0.847	-1.594	0.435	-0.836	-0.813
	1.0000	0.9977	0.0007	0.0007	0.9993	0.0007	0.9981	0.9993	0.9992
STEP01	59.8183	0.989817	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	11.2480	0.100397	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	165	491	0	0	0	0	0	0	0
	0.232	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	2.305	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.0018	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
STEP02	59.8183	N/A	0.814664	N/A	N/A	N/A	N/A	N/A	N/A
	11.2480	N/A	0.388570	N/A	N/A	N/A	N/A	N/A	N/A
	165	0	491	0	0	0	0	0	0
	0.232	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	2.305	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.0018	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
STEP03	59.8183	N/A	N/A	0.802444	N/A	N/A	N/A	N/A	N/A
	11.2480	N/A	N/A	0.398155	N/A	N/A	N/A	N/A	N/A
	165	0	0	491	0	0	0	0	0
	0.232	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	2.305	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.0018	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
STEP04	59.8183	N/A	N/A	N/A	0.755601	N/A	N/A	N/A	N/A
	11.2480	N/A	N/A	N/A	0.429730	N/A	N/A	N/A	N/A
	165	0	0	0	491	0	0	0	0
	0.232	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	2.305	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.0018	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
STEP05	59.6268	1.	1.	1.	1.	0.555328	0.666667	0.333333	0.333333
	11.3397	0.	0.	0.	0.	0.496929	0.471405	0.471405	0.471405
	168	3	3	3	3	488	3	3	3
	0.229	0.989	0.989	0.989	0.989	0.000	0.989	0.970	0.952
	2.095	0.177	0.833	0.866	0.993	0.000	-1.549	-1.703	-0.220
	0.0018	0.9977	0.9993	0.9994	1.0000	1.0000	0.0007	0.0007	0.9979
STEP06	59.8183	N/A	N/A	N/A	N/A	N/A	0.914460	N/A	N/A
	11.2480	N/A	N/A	N/A	N/A	N/A	0.279683	N/A	N/A
	165	0	0	0	0	0	491	0	0
	0.232	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	2.305	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.0018	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

ENTRIES ARE: MEAN/STD OF 2ND VAR FOR CASES MISSING FIRST VAR
NUMBER OF CASES MISSING 1ST VAR WITH VALUES FOR 2ND VAR
PHI CORRELATION OF MDFLAGS
T/SIG OF DIFF IN 2ND VAR BETWEEN CASES WITH & W/O 1ST VAR

TITLE VERSION IMPUTE.TEMP ON PROC.IMPUTE I71LXHD1

MISSING DATA REPORT #2: CHARACTERISTICS OF CASES WITH MISSING VALUES (FOR EACH VARIABLE)

MISSING	S E C O N D V A R I A B L E								
VARIABLE	M7XHTOTT	STEP01	STEP02	STEP03	STEP04	STEP05	STEP06	STEP07	STEP08
STEP07	59.8426	1.	1.	1.	1.	1.	1.	0.753086	1.
	11.2880	0.	0.	0.	0.	0.	0.	0.431216	0.
	170	5	5	5	5	5	5	486	5
	0.227	0.981	0.981	0.981	0.981	0.970	0.981	0.000	0.945
	2.382	0.229	1.078	1.121	1.286	2.028	0.691	0.000	2.816
	0.0018	0.9978	0.0007	0.0007	0.0007	0.0007	0.9988	1.0000	0.0007
STEP08	59.8848	1.	0.900000	0.900000	0.700000	0.500000	1.	0.900000	0.395010
	11.1311	0.	0.300000	0.300000	0.458258	0.500000	0.	0.300000	0.488853
	174	10	10	10	10	10	10	10	481
	0.243	0.964	0.964	0.964	0.964	0.952	0.964	0.945	0.000
	2.474	0.325	0.705	0.787	-0.415	-0.357	0.982	1.094	0.000
	0.0018	0.9979	0.9988	0.9991	0.9981	0.9980	0.9999	0.0007	1.0000

ENTRIES ARE: MEAN/STD OF 2ND VAR FOR CASES MISSING FIRST VAR
NUMBER OF CASES MISSING 1ST VAR WITH VALUES FOR 2ND VAR
PHI CORRELATION OF MDFLAGS
T/SIG OF DIFF IN 2ND VAR BETWEEN CASES WITH & W/O 1ST VAR

TITLE VERSION IMPUTE.TEMP ON PROC.IMPUTE I71LXHD1
MISSING DATA REPORT #3: CORRELATIONS BETWEEN REPORTED VALUES

FIRST VARIABLE	SECOND VARIABLE M7XHTOTT	STEP01	STEP02	STEP03	STEP04	STEP05	STEP06	STEP07	STEP08
M7XHTOTT	1.0000	0.1915	0.3873	0.4105	0.3292	0.2268	0.0838	0.1892	0.1438
	654	489	489	489	489	486	489	484	480
	0.0000	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
STEP01	0.1915	1.0000	0.2127	0.2044	0.1783	0.1137	0.3316	0.1731	0.0828
	489	491	491	491	491	488	491	486	481
	0.0003	0.0000	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
STEP02	0.3873	0.2127	1.0000	0.8823	0.7655	0.3762	0.1352	0.1777	0.2568
	489	491	491	491	491	488	491	486	481
	0.0003	0.0003	0.0000	0.0000	0.0000	0.0003	0.0003	0.0003	0.0003
STEP03	0.4105	0.2044	0.8823	1.0000	0.7534	0.4223	0.1409	0.1677	0.2652
	489	491	491	491	491	488	491	486	481
	0.0003	0.0003	0.0000	0.0000	0.0000	0.0003	0.0003	0.0003	0.0003
STEP04	0.3292	0.1783	0.7655	0.7534	1.0000	0.4466	0.1989	0.1922	0.3491
	489	491	491	491	491	488	491	486	481
	0.0003	0.0003	0.0000	0.0000	0.0000	0.0003	0.0003	0.0003	0.0003
STEP05	0.2268	0.1137	0.3762	0.4223	0.4466	1.0000	0.1155	0.1452	0.6272
	486	488	488	488	488	488	488	483	478
	0.0003	0.0003	0.0003	0.0003	0.0003	0.0000	0.0003	0.0003	0.0003
STEP06	0.0838	0.3316	0.1352	0.1409	0.1989	0.1155	1.0000	0.4692	0.1897
	489	491	491	491	491	488	491	486	481
	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0000	0.0003	0.0003
STEP07	0.1892	0.1781	0.1777	0.1677	0.1922	0.1452	0.4692	1.0000	0.2115
	484	486	486	486	486	483	486	486	476
	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0000	0.0003
STEP08	0.1438	0.0828	0.2568	0.2652	0.3491	0.6272	0.1897	0.2115	1.0000
	480	481	481	481	481	478	481	476	481
	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0000

ENTRIES ARE: CORR/N/SIG
NOTE: 472. CASES HAVE COMPLETE DATA
NO MORE SIGNIF VALUES FOR OBJF
TITLE VERSION IMPUTE.TEMP ON PROC.IMPUTE I71LXHD1
MISSING DATA REPORT #4: REGRESSION EQUATIONS FOR EACH VARIABLE

DEPENDENT VARIABLE	MULT R2	PREDICTOR VARIABLES	STD COEF	RAW COEF	VARIABLE NAME	PART COV	VARIABLE NAME	PART COV	VARIABLE NAME	PART COV
M7XHTOTT	0	CONST		0	STEP03	0.41055	STEP02	0.38731	STEP04	0.32921
					STEP05	0.22677	STEP01	0.19152	STEP07	0.18921
					STEP08	0.14379	STEP06	0.08384		
STEP02	0.15000	M7XHTOTT	0.38731	0.07702	STEP03	0.72329	STEP04	0.63797	STEP05	0.28839
		CONST		-1.1686	STEP08	0.20112	STEP01	0.13848	STEP07	0.10445
					STEP06	0.10276				
STEP03	0.78402	STEP02	0.85094	1.9786	STEP05	0.08378	STEP04	0.07537	STEP08	0.03499
		M7XHTOTT	0.08097	0.00579	STEP06	0.01902	STEP01	0.00796	STEP07	0.00116
		CONST		-.94353						
STEP04	0.56809	STEP03	0.74358	1.9822	STEP08	0.14846	STEP05	0.12720	STEP02	0.10015
		M7XHTOTT	0.02394	0.00201	STEP06	0.09210	STEP07	0.06297	STEP01	0.02176
		CONST		-.70580						
STEP05	0.21649	STEP04	0.29714	1.1864	STEP08	0.47088	STEP07	0.05477	M7XHTOTT	0.04749
		STEP03	0.19842	0.85485	STEP06	0.02844	STEP02	-.02629	STEP01	0.02015
		CONST		-.57958						

STEP08	0.39339	STEP05	0.62721	1.	STEP07	0.12046	STEP06	0.11724	STEP04	0.06895
		CONST		0	STEP02	0.02084	STEP01	0.01150	M7XHTOTT	0.00156
					STEP03	0.00031				
STEP06	0.05601	STEP04	0.15106	1.1882	STEP07	0.41121	STEP01	0.29336	STEP05	-.03788
		STEP08	0.13694	0.94690	STEP02	-.01557	M7XHTOTT	0.01441	STEP03	-.00924
		CONST		-.27183						
STEP07	0.24277	STEP06	0.45655	2.6381	STEP08	0.10321	STEP05	0.05822	STEP02	0.05754
		M7XHTOTT	0.15094	0.01940	STEP04	0.05173	STEP03	0.04144	STEP01	-.00226
		CONST		-2.5207						
STEP01	0.13697	STEP06	0.31782	2.4563	STEP02	0.10582	STEP03	0.09196	STEP04	0.06087
		M7XHTOTT	0.16487	0.02821	STEP05	0.03961	STEP07	-.00226	STEP08	-.00117
		CONST		-2.8618						
M7XHTOTT	0.19205	STEP03	0.37257	4.4281	STEP06	-.05188	STEP05	0.04263	STEP02	0.01872
		STEP07	0.10966	1.2023	STEP08	0.01387	STEP04	0.01035		
		STEP01	0.09583	4.4972						
		CONST		-5.9166						
STEP02	0.80243	STEP04	0.23188	0.48190	STEP05	-.02746	STEP01	0.02400	STEP08	-.01262
		STEP03	0.69749	1.5645	STEP07	0.01152	STEP06	-.01121		
		M7XHTOTT	0.02462	0.00174						
		CONST		-.71920						
STEP04	0.63425	STEP02	0.43883	1.1344	STEP06	0.06502	STEP05	0.04955	STEP07	0.02727
		STEP03	0.32473	0.81928	STEP01	0.00541				
		STEP08	0.14964	0.30748						
		M7XHTOTT	0.00441	0.00035						
		CONST		-.72316						

TITLE VERSION IMPUTE.TEMP ON PROC.IMPUTE I71LXHD1
MISSING DATA REPORT 04: REGRESSION EQUATIONS FOR EACH VARIABLE

DEPENDENT VARIABLE	MULT R2	PREDICTOR VARIABLES	STD COEF	RAW COEF	VARIABLE NAME	PART COV	VARIABLE NAME	PART COV	VARIABLE NAME	PART COV
STEP05	0.46899	STEP08	0.33622	1.2812	STEP06	-.03607	M7XHTOTT	0.03244	STEP07	-.02260
		STEP03	0.19572	0.57292	STEP02	-.01990	STEP01	0.00931		
		STEP04	0.11198	0.30379						
		CONST		-.19469						
STEP08	0.40821	STEP05	0.60935	1.5358	STEP06	0.06157	STEP04	0.05327	M7XHTOTT	-.01767
		STEP07	0.12305	0.35582	STEP03	-.01279	STEP01	-.00838	STEP02	0.00569
		CONST		-.12150						
STEP06	0.29283	STEP01	0.26494	3.6068	M7XHTOTT	-.06656	STEP02	-.04724	STEP05	-.03622
		STEP08	0.06524	0.19728	STEP03	-.03544				
		STEP07	0.40117	1.3753						
		STEP04	0.05529	0.19022						
		CONST		-3.8275						
STEP07	0.25401	STEP06	0.43707	2.4690	STEP02	0.03763	STEP04	0.02220	STEP03	0.02106
		M7XHTOTT	0.13691	0.01721	STEP05	-.00467	STEP01	-.00213		
		STEP08	0.10892	0.35469						
		CONST		-2.3783						

TITLE VERSION IMPUTE.TEMP ON PROC.IMPUTE I71LXHD1
MISSING DATA REPORT 05: CONDITIONAL DISTRIBUTIONS

```
EOR. N WITH  REGR    TARGET  TARGET CUMULATIVE CELL MEANS AND PROPORTIONS
VALUE  DATA   MEAN    MEAN    S.D.          1         2         3         4         5         6
     TARGET VARIABLE:  M7XHTOTT
  1     653    0.000    4.297     0.899   0.7 0.02 0.6 0.08 0.6 0.36 0.5 0.74 0.4 0.98 0.3
     TOTAL MEAN=    4.297;  SD=    0.899;  W/I CELL SD=    0.899;  R SQ= 0.000
     TARGET VARIABLE:  STEP02
  1      10    0.668    1.200     0.400   0.0 0.80 0.0
  2      41    1.583    1.561     0.496   0.0 0.44 0.0
  3     136    2.574    1.721     0.449   0.0 0.28 0.0
  4     185    3.478    1.881     0.324   0.0 0.12 0.0
  5     110    4.365    1.755     0.208   0.0 0.05 0.0
  6       9    5.211    2.000     0.000   0.5 0.00 0.0
     TOTAL MEAN=    1.315;  SD=    0.389;  W/I CELL SD=    0.359;  R SQ= 0.147
     TARGET VARIABLE:  STEP03
  1      91   -0.671    1.066     0.248   0.0 0.93 0.0
  2     400    '.380    1.970     0.171   0.0 0.03 0.0
     TOTAL MEAN=    1.802;  SD=    0.398;  W/I CELL SD=    0.187;  R SQ= 0.778
     TARGET VARIABLE:  STEP04
  1      97   -0.6 1    1.103     0.304   0.0 0.90 0.0
  2     394    1.397    1.916     0.277   0.0 0.08 0.0
     TOTAL MEAN=    1.756;  SD=    0.430;  W/I CELL SD=    0.283;  R SQ= 0.568
     TARGET VARIABLE:  ST^P05
  1     130   -0.271    1.177     0.382   0.0 0.82 0.0
  2     358    1.462    1.693     0.461   0.0 0.31 0.0
     TOTAL MEAN=    1.555;  SD=    0.497;  W/I CELL SD=    0.442;  R SQ= 0.211
     TARGET VARIABLE:  STEP08
  1     215    0.009    1.056     0.230   0.0 0.94 0.0
  2     266    1.000    1.669     0.471   0.0 0.33 0.0
     TOTAL MEAN=    1.395;  SD=    0.489;  W/I CELL SD=    0.382;  R SQ= 0.389
     TARGET VARIABLE:  STEP06
  1     305    0.485    1.872     0.334   0.0 0.13 0.0
  2     186    1.844    1.984     0.126   0.0 0.02 0.0
     TOTAL MEAN=    1.914;  SD=    0.280;  W/I CELL SD=    0.274;  R SQ= 0.038
     TARGET VARIABLE:  STEP07
  1     111   -0.037    1.459     0.498   0.0 0.54 0.0
  2     375    1.307    1.840     0.367   0.0 0.16 0.0
     TOTAL MEAN=    1.753;  SD=    0.431;  W/I CELL SD=    0.401;  R SQ= 0.137
     TARGET VARIABLE:  STEP01
  1     156    0.195    1.968     0.176   0.0 0.03 0.0
  2     335    1.378    2.000     0.000   0.5 0.00 0.0
     TOTAL MEAN=    1.990;  SD=    0.100;  W/I CELL SD=    0.099;  R SQ= 0.022
TITLE VERSION IMPUTE.TEMP ON PROC.IMPUTE I71LXHD1
 MISSING DATA REPORT 05:  CONDITIONAL DISTRIBUTIONS

EOR. N WITH  REGR    TARGET  TARGET CUMULATIVE CELL MEANS AND PROPORTIONS
VALUE  DATA   MEAN    MEAN    S.D.          1         2         3         4         5         6
     TARGET VARIABLE:  M7XHTOTT
  1     169  -18.109    3.538     0.720   0.7 0.05 0.5 0.18 0.5 0.73 0.3 0.98 0.5 1.00 0.5
  2       0    1.500    0.000     0.000   0.5 0.00 0.5 0.00 0.5 0.00 0.5 0.00 0.5 0.00 0.5
  3       1    2.511    4.285     0.000   0.5 0.00 0.5 0.00 0.5 0.00 0.3 1.00 0.5 1.00 0.5
  4      81    3.009    4.230     0.901   1.0 0.01 0.6 0.12 0.5 0.33 0.5 0.78 0.3 0.98 0.2
  5     308    4.211    4.494     0.792   0.7 0.00 0.7 0.05 0.6 0.28 0.5 0.69 0.4 0.98 0.2
  6      94   54.620    5.075     0.438   0.5 0.0? 0.5 0.00 0.5 0.00 0.6 0.46 0.4 0.97 0.4
     TOTAL MEAN=    4.297;  SD=    0.902;  W/I CELL SD=    0.747;  R SQ= 0.314
     TARGET VARIABLE:  STEP02
  1     150   -0.198    1.300     0.458   0.0 0.70 0.0
  2     361    1.431    2.000     0.000   0.5 0.00 0.0
     TOTAL MEAN=    1.815;  SD=    0.389;  W/I CELL SD=    0.236;  R SQ= 0.632
     TARGET VARIABLE:  STEP04
  1     103   -0.484    1.097     0.296   0.0 0.90 0.0
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  2      388    1.394     1.930      0.254    0.0 0.07 0.0
    TOTAL MEAN=    1.756;  SD=      0.430;  W/I CELL SD=     0.264;  R SQ= 0.623
    TARGET VARIABLE:   STEP05
  1      294    0.410     1.299      0.458    0.0 0.70 0.0
  2      194    1.893     1.943      0.231    0.0 0.06 0.0
    TOTAL MEAN=    1.555;  SD=      0.497;  W/I CELL SD=     0.384;  R SQ= 0.402
    TARGET VARIABLE:   STEP08
  1      215    0.118     1.065      0.247    0.0 0.93 0.0
  2      266    1.730     1.662      0.473    0.0 0.34 0.0
    TOTAL MEAN=    1.395;  SD=      0.489;  W/I CELL SD=     0.389;  R SQ= 0.368
    TARGET VARIABLE:   STEP06
  1      123   -0.353     1.691      0.462    0.0 0.31 0.0
  2      368    1.489     1.989      0.104    0.0 0.01 0.0
    TOTAL MEAN=    1.914;  SD=      0.280;  W/I CELL SD=     0.248;  R SQ= 0.213
    TARGET VARIABLE:   STEP0
  1      139    0.152     1.525      0.499    0.0 0.47 0.0
  2      347    1.341     1.844      0.362    0.0 0.16 0.0
    TOTAL MEAN=    1.753;  SD=      0.431;  W/I CELL SD=     0.406;  R SQ= 0.112
TITLE VERSION IMPUTE.TEMP ON PROC.IMPUTE I71LXHD1

  VARIABLE         MEAN OF        MEAN SQUARED ERROR
               IMPUTED VALUES    DUE TO MISSING DATA

   M7XHYOTT        58.932            2.6492
   STEP01           0.983            0.0036
   STEP02           0.840            0.0145
   STEP03           0.818            0.0094
   STEP04           0.740            0.0188
   STEP05           0.554            0.0398
   STEP06           0.851            0.0180
   STEP07           0.763            0.0501
   STEP08           0.429            0.0432
 NORMAL EXIT FROM PROC IMPUTE
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Appendix D

LVI HANDS-ON TESTS:
PRE-IMPUTATION INTERCORRELATIONS AND RESIDUALS, AND
PRE-IMPUTATION AND RESIDUAL MEANS AND VARIANCES

Table D-1

Matrix of Pre-Imputation Intercorrelations and Residuals for MOS 11B on the Hands-On Tasks

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	--	-0053	0681	0780	-0166	1040	1427	0322	0362	0076	0002	-0713	-0734
2	1554	--	0757	-0499	-0183	0516	0328	0241	0400	0589	-0154	-0530	-0121
3	2507	2538	--	0081	0319	0725	1027	0140	0321	-0417	-0162	-0659	-0337
4	1411	0252	0068	--	0983	0549	1276	0170	0049	-0784	0905	0613	-1588
5	1897	1766	2492	1365	--	0357	1575	0164	1294	-1783	0991	0498	-0752
6	2860	2748	3985	1061	1630	--	2454	0872	0349	-0123	0260	0081	-1095
7	1499	1180	1943	1787	1185	4710	--	1201	1216	-1730	1160	0777	-1365
8	1287	1564	1163	0320	1363	2380	2134	--	0565	0433	0191	0330	-0337
9	0944	0882	1293	-0058	1752	2155	2391	1231	--	-0928	0387	0919	0256
10	0582	1083	0706	-0577	-0734	0148	-0567	0410	-0685	--	-0432	-1017	0333
11	2539	1709	2027	1331	2335	2698	1411	1785	1388	-0011	--	0812	-0823
12	0746	0605	1073	0213	2816	1165	1291	1020	1342	-0918	2026	--	-0761
13	0200	2068	0851	-1172	0532	0973	-0608	0576	0972	0955	0869	0039	--

Note: The Pre-Imputation Intercorrelation Matrix is on the lower diagonal and the Residual Matrix is on the upper diagonal.

Table D-2

Pre-Imputation and Residual Means and Variances for MOS 11B on the Hands-On Tasks

	Pre-Imputation		Residual	
	Mean	Variance	Mean	Variance
1	76.46	412.90	.00	17.91
2	85.30	123.76	.10	4.90
3	83.72	427.71	.28	36.11
4	65.19	363.46	.12	29.08
5	82.17	416.81	.38	69.27
6	47.95	558.89	-.42	24.73
7	47.56	611.50	.59	70.60
8	85.00	310.98	.51	35.49
9	85.53	326.41	.66	51 21
10	42.96	188.14	.10	1.33
11	89.77	271.65	.58	14.02
12	73.23	602.90	.78	50.61
13	33.43	952.91	-1.57	126.58

Table D-3

Matrix of Pre-Imputation Intercorrelations and Residuals for MOS 13B on the Hands-On Tasks

	1	2	3	4	5	6	7	8	9	10
1	--	0921	0347	-0072	-1197	-0222	0435	1547	1351	-0674
2	1451	--	0859	1005	-1452	0730	0584	0821	1927	-0805
3	0772	2673	--	1276	-0739	-0145	0474	-0297	1036	0897
4	0770	2387	6020	--	-0439	0077	0641	-0350	1475	1215
5	-1489	-0610	0072	-0369	--	-0300	-0353	-1285	-1678	0599
6	1457	2552	1723	1463	0672	--	0102	-0009	0574	-0220
7	1017	1165	1189	1070	0264	0735	--	-0022	0665	0307
8	3896	1672	0710	1049	-0742	0559	0570	--	1497	-0652
9	2162	3779	1645	1690	-0879	2305	0830	1341	--	-0822
10	0562	0923	2029	2002	1317	1830	2041	-0230	0420	--

Note: The Pre-Imputation Intercorrelation Matrix is on the lower diagonal and the Residual Matrix is on the upper diagonal.

Table D-4

Pre Imputation and Residual Means and Variances for MOS 13B on the Hands-On Tasks

	Pre-Imputation Mean	Pre-Imputation Variance	Residual Mean	Residual Variance
1	74.33	768.96	.16	174.26
2	78.02	352.18	.14	31.22
3	38.56	1583.26	-.02	394.35
4	33.32	1670.96	-.37	534.13
5	73.48	508.88	.46	56.39
6	24.39	1157.82	-.28	191.79
7	86.53	292.71	.60	24.61
8	75.12	431.53	.12	37.57
9	59.52	579.32	.38	62.42
10	44.96	478.11	-.43	17.21

Table D-5

Matrix of Pre-Imputation Intercorrelations and Residuals for MOS 19E on the Hands-On Tasks

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	--	0056	0639	-0163	0362	-0011	0240	-0987	-0074	-0621	0793	-0763	0374	-0671	0466
2	0645	--	0399	-0309	0408	-0087	-0038	-0895	-0047	-0635	0280	-0751	0155	-0912	0560
3	1257	1474	--	-0704	0130	-0329	0117	-0702	0224	-0511	0272	-0442	-0501	0288	0017
4	0728	1002	0176	--	0134	-0315	0240	0089	0945	0214	0694	-0126	-0251	-0855	0406
5	1315	0324	2348	1005	--	0885	1404	-1196	1257	-0751	0649	-2036	-0294	-0630	0110
6	0028	1459	1382	0314	2368	--	1061	-0733	0333	-0463	-0144	-1386	-0187	-0143	-0001
7	0510	1132	1809	-0137	3333	1432	--	-0816	1405	-0796	1141	-2429	0161	-1705	0099
8	-0601	0173	-0608	1624	-0345	-0529	-0694	--	0297	0948	0016	0463	-0860	-0548	-0569
9	2180	0911	0433	2259	2254	-0319	1796	0645	--	0204	1594	-1453	-0197	-1501	0726
10	0399	0416	0945	1362	0941	0729	0336	3667	0895	--	0554	0515	-0590	-0618	-0391
11	1108	0584	0246	1033	1421	0624	1534	2258	2508	2151	--	-0478	-0208	-0519	0317
12	1228	0463	0601	1255	-1037	-0333	-0824	1062	-0242	1513	0216	--	-0507	0444	-1100
13	0621	3409	0642	1072	0165	1203	-0343	0856	-0517	1291	0091	0484	--	0136	0328
14	0510	1184	1501	0516	-0144	-0069	-0408	0882	-0435	0370	0190	1822	0637	--	-0625
15	1109	1425	0284	1541	1828	1036	1465	1092	2195	1422	1723	0783	2448	0872	--

Note: The Pre-Imputation Intercorrelation Matrix is on the lower diagonal and the Residual Matrix is on the upper diagonal.

Table D-6

Pre-Imputation and Residual Means and Variances for MOS 19E on the Hands-On Tasks

	Pre-Imputation Mean	Pre-Imputation Variance	Residual Mean	Residual Variance
1	70.26	532.71	0.52	49.43
2	89.75	336.66	0.20	21.75
3	83.42	406.05	0.48	22.01
4	80.46	349.87	-0.00	8.08
5	45.43	937.40	-0.08	78.69
6	85.01	227.19	0.44	17.01
7	65.13	203.57	0.64	25.70
8	72.80	372.30	0.61	51.59
9	71.13	914.86	0.64	93.30
10	72.22	394.64	0.25	40.87
11	77.24	393.40	0.49	37.52
12	57.79	1424.73	-0.45	321.49
13	96.78	114.05	0.40	18.03
14	88.29	267.70	0.68	27.39
15	86.33	332.43	0.31	16.57

Table D-7

Matrix of Pre Imputation Intercorrelations and Residuals for MOS 19K on the Hands-On Tasks

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	--	0389	0220	0006	-0092	-0298	-0863	0098	-0726	0228	0272	0348	0168
2	1078	-	0219	-0114	0089	-0581	-0225	0125	-0486	0003	-0874	0100	-0442
3	2745	0943	--	-0321	0335	-0482	0079	-0088	-0363	0410	-0244	0476	-0220
4	1409	1102	1038	--	0172	-0644	-0506	-1152	-0208	-0209	-0784	0517	0212
5	0455	0412	0883	1023	--	-0512	-0314	0105	-0975	1144	-0137	-0015	-0507
6	0972	1637	-0318	0118	0107	--	0246	0019	0671	0213	0383	-0505	0465
7	0173	0526	1322	0421	2145	0789	--	0149	0678	-0211	-0316	-0333	-0070
8	1074	2365	0866	1142	0308	1004	-0079	--	-0070	0015	-0147	-0395	-0166
9	-0165	1829	-0144	0264	-0257	2690	0458	0846	--	-0907	-1058	-0234	0307
10	1208	0849	0880	1241	1999	1388	-0170	0790	-0184	--	0605	-0001	0219
11	1471	1183	0710	-0422	0317	2239	-0532	1036	0233	1279	--	-0995	0325
12	0353	0601	0479	1820	0545	-0323	0074	0109	0032	-0309	-0758	--	-0510
13	0868	0853	0169	0230	0835	1657	0773	-0389	1173	0048	1218	-0505	--

Note: The Pre-Imputation Intercorrelation Matrix is on the lower diagonal and the Residual Matrix is on the upper diagonal.

Table D-8

Pre-Imputation and Residual Means and Variances for MOS 19K on the Hands-On Tasks

	Pre-Imputation Mean	Pre-Imputation Variance	Residual Mean	Residual Variance
1	85.33	265.84	0.38	18.47
2	80.55	907.42	-0.14	120.13
3	85.89	392.57	0.52	18.70
4	78.76	205.57	0.75	3.95
5	78.34	466.82	0.53	36.86
6	88.63	160.86	0.74	23.24
7	53.64	1213.07	-0.08	137.64
8	96.15	83.75	0.33	4.99
9	76.05	1121.50	0.47	287.09
10	90.87	238.45	0.33	31.60
11	54.21	494.56	0.09	24.21
12	16.53	320.41	-0.84	-0.53
13	83.84	399.70	0.73	31.69

Table D-9

Matrix of Pre-Imputation Intercorrelations and Residuals for MOS 31C on the Hands-On Tasks

	1	2	3	4	5	6	7	[illegible]	9	10	11	12	13	14
1	--	-0221	0135	1202	-03[illegible]	0077	-0260	-0247	1479	0649	0500	0492	0119	0538
2	0950	--	-0313	0425	0492	0050	-0192	0086	-072[illegible]	-1222	-0206	-0684	0365	-0271
3	2468	2169	--	0686	-034[illegible]	0394	-0311	-0188	-0119	-0854	0276	0272	0074	0077
4	3643	1522	1794	--	2730	-0342	-1252	1218	1560	2412	1117	0516	0133	-0497
5	0296	1833	0404	2425	--	-0157	-1571	-1095	-1387	-0216	-0940	-0993	-1140	-1998
6	0200	0492	0948	-0340	1381	--	0410	0762	-0267	-1664	-0645	-0168	-0852	0537
7	0268	0763	0912	-0792	1501	1865	--	-0377	-0801	-1010	-0553	-1150	-1676	-0440
8	0455	1175	1163	1061	2155	2321	3483	--	0351	0143	1154	0875	0147	0110
9	1219	0298	0770	1706	0565	0582	2676	3038	--	1236	0642	0082	-0048	1037
10	0882	0529	0462	2831	1233	0335	1427	2360	5384	--	0105	-0074	-0214	-0575
11	2536	1098	2173	2238	-0139	0185	1046	2748	1885	1165	--	1021	0141	0116
12	2157	0585	1822	1868	-0188	1036	0662	3279	2228	0614	4127	--	0123	0093
13	0330	1266	116[illegible]	1218	0834	3199	2539	4130	2783	2058	2650	2620	--	-0212
14	1559	0724	18[illegible]	0357	-0861	2187	2194	2529	3191	1750	1816	2568	2534	--

Note: The Pre-Imputation Intercorrelation Matrix is on the lower diagonal and the Residual Matrix is on the upper diagonal.

Table D-10

Pre-Imputation and Residual Means and Variances for MOS 31C on the Hands-On Tasks

	Pre-Imputation		Residual	
	Mean	Variance	Mean	Variance
1	74.98	476.38	0.17	33.40
2	82.26	287.28	0.11	33.71
3	70.25	939.84	0.16	54.10
4	72.22	838.31	-0.77	237.48
5	54.03	556.99	-0.01	[illegible]
6	66.85	1046.99	0.31	220.35
7	62.96	1208.30	-1.29	221.87
8	69.65	663.17	-0.52	74.95
9	82.25	258.06	0.09	25.58
10	80.72	310.67	0.33	40.46
11	66.90	572.49	0.09	50.46
12	59.30	1356.55	0.31	237.91
13	67.93	606.10	0.32	42.17
14	43.13	405.47	-0.97	33.17

Table D-11

Matrix of Pre-Imputation Intercorrelations and Residuals for MOS 638 on the Hands-On Tasks

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	--	-0141	0237	1586	0800	-1256	0885	0211	0460	-0198	-0012	0520	-0832
2	1020	--	0888	-0097	0006	0512	-0922	0213	-0183	-0388	-0873	-0097	0171
3	1150	2110	--	1495	0155	-0173	-0523	-0132	0170	-0703	0107	0259	-0868
4	2314	1235	1771	--	-0229	-0012	0503	-0148	1450	-0722	-0316	0302	0540
5	2257	0920	-0248	0327	--	-0316	0366	0265	0025	0152	0390	-0259	-0230
6	-0675	-0042	0131	-0326	0685	-	-0495	-1201	-0978	-0216	0352	-1113	0107
7	2143	0168	0219	1444	1003	0123	--	-0431	-0695	0138	0093	0113	-0122
8	0948	0662	0348	0678	1017	-0017	1510	--	0760	-0915	-0397	0624	-0316
9	1124	0507	0709	2304	0267	-0189	1835	2437	--	-0249	-0033	-0875	0103
10	0541	-0170	-0596	0457	0837	1662	1972	0906	0656	--	-0465	0251	0852
11	1016	0648	0632	0347	1112	1017	1340	1043	0602	0417	-	-1374	-1299
12	1087	0630	1130	0822	0426	-0970	1123	1555	1215	1065	-0725	--	1703
13	0371	1899	0273	0867	0340	1552	2582	1381	1210	2343	0058	2234	--

Note: The Pre-Imputation Intercorrelation Matrix is on the lower diagonal and the Residual Matrix is on the upper diagonal.

Table D-12

Pre-Imputation and Residual Means and Variances for MOS 638 on the Hands-On Tasks

	Pre-Imputation		Residual	
	Mean	Variance	Mean	Variance
1	70.94	518.58	0.11	35.89
2	79.32	212.56	0.09	10.12
3	70.18	940.91	0.54	95.85
4	80.77	563.13	-2.04	132.81
5	79.72	478.30	0.45	30.02
6	81.99	633.97	0.98	151.99
7	67.33	533.72	0.18	45.43
8	68.87	330.56	1.00	27.58
9	86.77	634.16	0.56	100.03
10	89.17	403.58	1.17	39.81
11	85.90	625.04	1.12	123.24
12	92.84	192.58	0.87	29.45
13	69.14	735.48	-0.28	116.36

Table D-13

Matrix of Pre-Imputation Intercorrelations and Residuals for MOS 71L on the Hands-On Tasks

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	-	-0102	0444	-0088	-0337	-1234	0203	-0366	0140	0114	-0938	-1485	0628
2	1423	--	0513	0952	0339	-0349	1042	0723	0875	0265	0903	0322	0872
3	2813	2745	--	0919	0122	-0310	0209	0443	-0122	-0194	0025	-0155	0457
4	1186	2714	1813	--	0485	0175	0498	0529	0964	0546	0369	0044	0750
5	0598	0537	2448	0143	--	-0164	-0047	0359	-0536	0700	0559	-0223	-0481
6	0469	1078	1309	1138	2041	--	-0061	0069	-0033	-0729	-0527	1196	-0669
7	1262	2650	1689	2147	1869	2270	--	0315	1537	0897	0871	0905	0990
8	0624	1809	1696	1128	1916	2070	2437	--	0427	0932	1097	0434	-0295
9	1120	2323	1692	1864	1266	1935	4201	2855	--	0410	0530	0713	0936
10	0914	2433	1534	1865	1995	2271	3685	3614	3640	--	0672	-0478	0137
11	0718	3055	1835	1629	2535	2487	3081	4197	3372	4227	--	1025	0114
12	-1180	1147	0414	0602	0477	1763	1004	1199	1693	0808	1510	--	-0080
13	1595	2341	0870	0597	0300	0847	2327	1144	2431	2515	2197	-0343	--

Note: The Pre-Imputation Intercorrelation Matrix is on the lower diagonal and the Residual Matrix is on the upper diagonal.

Table D-14

Pre-Imputation and Residual Means and Variances for MOS 71L on the Hands-On Tasks

	Pre-Imputation		Residual	
	Mean	Variance	Mean	Variance
1	71.44	585.31	0.40	50.30
2	67.27	313.65	-0.08	18.01
3	60.66	1051.54	0.06	115.53
4	74.50	620.46	0.33	66.15
5	21.77	984.41	-1.81	187.13
6	55.59	763.77	-0.03	57.27
7	62.60	770.02	0.11	81.59
8	76.61	370.72	0.26	19.16
9	61.46	423.75	-0.04	18.84
10	72.48	520.16	0.10	24.02
11	70.78	390.00	-0.06	20.58
12	28.26	1090.87	-4.30	164.28
13	59.11	273.09	-14.86[1]	177.25[2]

[1] $F = 3.88$ ($p < .01$). [2] $F = 2.85$ ($p < .01$)

Table D-15

Matrix of Pre-Imputation Intercorrelations and Residuals for MOS 88M on the Hands-On Tasks

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	--	-0283	0812	1254	1093	0231	-0045	0543	0664	0881	0340	-0689	-0641	0231	-0559
2	2328	--	0643	-0841	-1157	0394	-0316	-1011	0211	0078	-0834	-0076	-0413	0353	0913
3	1886	1757	--	0339	0638	0219	0503	0042	0720	0481	0260	0141	-0382	-0162	0434
4	2371	0120	1832	--	2177	-0020	0722	1745	-0078	0595	0809	-0615	-1929	-1367	-1913
5	2879	-0073	1697	5042	--	-0279	0382	1918	-0183	0288	1140	-0806	-1959	-1944	-1776
6	1464	1099	1499	1626	1821	--	-0397	0048	0656	0377	0608	0236	-0241	-0472	-0421
7	1801	1115	1235	1724	2412	1241	--	1345	0266	-0041	-0073	-1095	-0335	-0547	-0108
8	1987	0267	1516	2527	3026	1396	4113	--	0070	-0136	0422	-1033	-1235	-1549	-1513
9	1520	1847	1286	0734	0578	1024	1860	0751	--	-0336	-0346	0042	-0075	0297	0183
10	2215	0908	1753	0678	1409	0969	1325	0610	1353	--	0125	-0121	-0778	0228	-0125
11	1159	1065	1186	1486	1462	1226	1433	1234	0959	0633	--	0038	-1188	-0862	-0724
12	1627	1263	1063	0403	-0133	1294	-0007	-0165	0480	1474	0909	--	0052	-0094	-0104
13	-0407	0854	0323	-0822	-0348	0463	0946	-0218	1344	-0139	0202	0361	--	1598	1414
14	-0562	0256	0021	-0739	-0207	0181	0069	-0851	1315	0257	-0364	-0111	5682	--	1238
15	-0384	1484	0610	-1098	-1115	0385	-0260	-0549	0536	0693	-0034	1278	4343	4152	--

Note: The Pre-Imputation Intercorrelation Matrix is on the lower diagonal and the Residual Matrix is on the upper diagonal.

Table D-16

Pre-Imputation and Residual Means and Variances for MOS 88M on the Hands-On Tasks

	Pre-Imputation		Residual	
	Mean	Variance	Mean	Variance
1	74.28	549.94	0.44	39.53
2	76.69	473.41	0.38	88.96
3	71.24	424.45	0.12	19.17
4	78.02	334.89	0.50	21.31
5	74.73	271.68	0.11	18.43
6	33.15	1077.70	-2.46	125.77
7	56.38	1173.30	-0.07	217.19
8	42.19	1557.36	-0.60	389.30
9	79.53	394.39	0.25	50.77
10	78.25	277.52	-0.29	6.75
11	72.22	571.46	0.41	56.51
12	84.73	384.06	0.69	41.14
13	81.20	438.95	0.71	40.29
14	80.80	633.71	1.13	114.23
15	69.23	403.58	0.31	34.28

Table D-17

Matrix of Pre-Imputation Intercorrelations and Residuals for MOS 91A on the Hands-On Tasks

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	--	0355	-0160	0740	0936	0151	0211	0040	0408	-0397	1204	0068	0128
2	2071	--	0732	0732	0281	-0207	0508	-0148	-0106	-0991	1559	0090	0557
3	1137	3542	--	0647	0724	-0162	0876	0454	0649	-0026	1179	-0406	1831
4	2118	2139	1139	--	0413	0139	1034	0019	0565	0009	1422	0407	0886
5	2910	1741	1740	1206	--	-0153	0506	1230	1073	0296	0981	0729	0248
6	2240	2424	1155	2815	1216	--	0034	-0372	0172	-0377	0050	0041	-0269
7	2210	3452	2386	2546	2027	2062	--	0380	0652	0480	0596	0575	0597
8	0663	0236	1104	0396	1889	0957	1470	--	1582	0877	0413	0258	0972
9	1078	0980	1711	1017	2068	0775	2421	4072	--	1088	0703	0618	0866
10	1157	0986	0678	1198	1489	1098	2998	1731	1899	--	0475	1345	-0265
11	0854	2014	1711	1835	1861	1021	2261	0251	1108	0681	--	0045	1237
12	1898	2183	0729	1279	1764	1155	3136	1111	1628	6553	1087	--	-0664
13	0507	0803	2356	1501	1638	1059	2182	0922	1420	0555	6722	0298	--

Note: The Pre-Imputation intercorrelation Matrix is on the lower diagonal and the Residual Matrix is on the upper diagonal.

Table D-18

Pre-Imputation and Residual Means and Variances for MOS 91A on the Hands-On Tasks

	Pre-Imputation		Residual	
	Mean	Variance	Mean	Variance
1	85.33	213.33	0.40	18.52
2	73.17	791.66	-0.24	128.30
3	68.02	559.28	0.34	71.15
4	73.82	266.67	0.10	11.67
5	79.19	325.01	0.40	34.19
6	68.72	727.40	0.14	48.07
7	79.53	396.96	0.19	35.93
8	84.48	304.33	0.66	43.83
9	84.87	211.97	0.82	20.34
10	74.17	350.70	0.16	36.74
11	65.82	961.61	-0.28	147.54
12	76.47	462.86	0.20	57.72
13	53.24	650.95	-0.60	87.35

Table D-19

Matrix of Pre-Imputation Intercorrelations and Residuals for MOS 95B on the Hands-On Tasks

	1	2	3	4	5	6	7	8	9	10	11	12
1	--	-1379	0083	-0052	0071	-0846	0347	0126	-0148	0486	0907	0276
2	-0323	--	1140	-0286	-0408	1085	-0897	1250	-0181	-2473	-1724	-1402
3	0926	2942	--	-0175	-0615	0207	-0177	0499	0315	-1052	-0613	0194
4	1835	0612	0921	--	0193	0335	0052	0426	-0125	0284	-0009	0401
5	0349	-0109	0734	0812	--	-0163	0864	0394	-0388	0149	0119	0660
6	1134	1528	1742	2253	1426	--	-0290	1456	-0311	-0382	-0302	-0162
7	1179	0073	0699	1011	1518	0811	--	-0371	-0376	-0682	-0111	-0780
8	0657	1313	0358	0288	2276	1064	0070	--	-0945	0082	0258	-0301
9	1067	0126	1115	0606	-0238	1398	1190	0214	--	-0197	-0684	0406
10	1298	-1965	-0850	1452	0506	0401	-0437	-0051	1122	--	0564	1294
11	1959	-0354	1236	2134	0261	0744	0591	0770	0380	1430	--	0340
12	0823	-0110	0750	1344	1562	0539	0293	1162	1021	0950	2083	--

Note: The Pre-Imputation Intercorrelation Matrix is on the lower diagonal and the Residual Matrix is on the upper diagonal.

Table D-20

Pre-Imputation and Residual Means and Variances for MOS 95B on the Hands-On Tasks

	Pre-Imputation		Residual	
	Mean	Variance	Mean	Variance
1	73.66	488.68	0.35	34.79
2	85.05	234.17	0.35	17.46
3	74.81	483.88	0.42	57.44
4	80.05	532.73	0.50	38.55
5	57.84	735.54	0.60	92.37
6	66.36	1118.30	0.91	156.42
7	75.80	439.20	1.10	29.66
8	34.96	594.32	-6.16	-16.39
9	73.17	231.14	0.02	-0.01
10	78.57	123.74	-0.02	3.18
11	70.93	827.88	0.46	97.45
12	61.01	525.34	-0.16	39.96

Appendix E

MATRIX OF PRE-IMPUTATION INTERCORRELATIONS AND RESIDUALS
ON ALL CRITERION MEASURES, BY MOS

Table E-i

Matrix of Pre-imputation Intercorrelations and Residuals on all Criterion Measures for MOS 11B

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	-	-005	000	004	010	-001	003	001	000	003	020	005	-004	003	-007	006	005
2	211	-	-004	002	092	006	-007	-004	-004	-001	-003	-014	-009	004	006	-005	003
3	-209	-036	-	013	-003	-010	006	000	-003	001	-014	-004	000	-009	-005	-009	-007
4	099	127	078	-	-002	-015	017	013	012	006	-002	012	-005	-001	-005	009	-007
5	150	067	-023	075	-	002	-001	006	006	-002	011	-004	006	009	014	005	006
6	310	103	-441	-005	077	-	-002	002	010	-005	006	-009	-006	003	012	000	003
7	822	221	-224	128	099	381	-	000	000	001	006	005	-007	001	-001	-003	-001
8	871	221	-245	096	129	359	865	-	001	002	008	-005	-013	008	003	002	006
9	673	114	-326	-013	047	386	730	748	-	000	008	-006	-007	003	001	003	001
10	683	201	-190	244	065	330	711	676	537	-	003	-003	-009	007	-003	005	004
11	135	069	-120	032	030	047	130	148	107	075	-	004	002	014	007	-002	010
12	312	113	-140	031	163	159	270	330	195	131	162	-	-016	-008	-002	-020	-014
13	177	059	-107	120	196	120	168	197	111	119	084	342	-	-005	008	-009	-003
14	304	120	-157	-027	191	193	299	340	256	069	152	476	310	-	-008	-007	000
15	091	052	-097	-036	063	063	117	121	117	011	130	167	116	368	-	-012	-005
16	137	112	-044	004	123	133	168	138	131	037	057	167	086	399	187	-	-004
17	208	099	-115	-029	154	126	174	225	161	049	146	357	300	706	339	334	-

Note: The Pre-Imputation Intercorrelation Matrix is on the lower diagonal and the Residual Matrix is on the upper diagonal. Decimals omitted.

Table E-2

Pre-imputation and Residual Means and Variances on all Criterion Measures for MOS 11B

	Pre-Imputed Mean	Pre-Imputed Variance	Residual Mean	Residual Variance
1	4.67	0.50	0.00	0.00
2	3.60	10.06	0.03	0.03
3	0.35	0.66	0.00	0.01
4	253.05	836.41	0.22	1.76
5	2.81	0.22	0.00	0.00
6	50.00	25.26	-0.02	-0.03
7	4.63	0.79	0.00	0.00
8	4.43	0.74	0.00	0.00
9	4.62	0.86	0.00	0.00
10	4.77	0.89	0.00	0.00
11	11.88	5.39	0.00	0.05
12	95.30	177.49	0.06	-3.41
13	22.53	14.39	0.02	-0.19
14	78.21	216.14	0.06	-1.65
15	3.86	2.86	0.02	-0.01
16	7.24	6.65	0.01	-0.04
17	21.32	19.26	0.02	0.13

Table E-3

Matrix of Pre-imputation Intercorrelations and Residuals on all Criterion Measures for MOS 13B

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	-	006	-004	-015	-023	-003	002	000	003	-005	-001	009	-012	016	-015	030	009	003	-021
2	260	-	005	-006	-002	-001	006	002	006	-007	011	-006	-023	017	017	008	017	016	005
3	-179	-082	-	000	001	000	-020	-008	-011	-011	013	007	023	-005	018	-004	-001	-004	005
4	080	151	-041	-	-001	008	-008	-005	-004	-006	005	025	-001	009	002	001	-007	-026	-025
5	111	173	-038	126	-	001	-005	-002	-008	004	020	-014	-005	018	-018	023	003	-002	-014
6	249	160	-469	016	036	-	014	004	009	005	-017	-013	000	007	-021	-002	-002	-012	-012
7	685	233	-302	100	077	366	-	-001	-003	005	-008	028	-008	022	032	009	003	022	-005
8	754	294	-258	100	100	354	838	-	-001	001	006	028	006	031	013	012	011	020	-002
9	555	158	-309	020	-005	323	713	705	-	-003	-005	019	-002	010	007	009	012	022	-001
10	531	220	-282	235	044	320	654	615	499	-	002	018	007	024	004	009	-011	008	-015
11	052	-015	-038	031	017	050	000	022	-030	-042	-	008	000	010	-008	003	-012	-003	009
12	188	064	-058	005	-009	084	146	170	105	-034	178	-	003	-002	009	-003	-017	001	-002
13	162	012	-029	-034	020	139	134	163	129	045	049	217	-	000	-003	011	-016	005	-001
14	294	133	-039	051	045	170	209	221	082	125	120	354	211	-	-018	-021	-011	-039	-003
15	168	060	-077	-061	-019	189	231	211	191	027	112	401	193	184	-	-003	021	-006	-020
16	098	022	-080	-108	058	083	072	082	097	-007	018	138	113	124	189	-	-009	-017	005
17	103	012	-036	-012	064	043	074	101	097	001	059	108	044	099	269	113	-	002	011
18	203	061	-079	-041	063	133	205	220	209	015	128	323	203	144	663	220	237	-	-014
19	297	073	-089	-041	-034	161	280	286	260	091	087	405	215	334	629	206	262	561	-

Note: The Pre-Imputation Intercorrelation Matrix is on the lower diagonal and the Residual Matrix is on the upper diagonal. Decimals omitted.

Table E-4

Pre-imputation and Residual Means and Variances on all Criterion Measures for MOS 13B

	Pre-Imputed Mean	Pre-Imputed Variance	Residual Mean	Residual Variance
1	4.69	0.48	0.00	0.00
2	3.18	9.22	0.01	0.00
3	0.53	0.93	0.00	0.00
4	242.82	1253.49	-0.03	16.33
5	2.28	0.51	0.00	0.00
6	50.01	28.11	0.02	0.23
7	4.51	0.85	0.01	-0.01
8	4.29	0.77	0.00	0.00
9	4.53	0.88	0.00	0.00
10	4.74	0.88	0.01	-0.01
11	8.28	10.13	0.05	0.04
12	41.05	156.59	0.01	1.63
13	32.91	30.75	-0.10	1.16
14	43.74	160.62	0.03	3.56
15	29.98	39.78	0.02	-2.03
16	1.07	0.50	0.01	0.01
17	5.98	4.60	0.02	0.10
18	22.66	26.21	0.03	-0.86
19	46.73	125.13	0.00	-4.79

Table E-5

Matrix of Pre-imputation Intercorrelations and Residuals on all Criterion Measures for MOS 19E

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	-	008	042	-015	-005	-026	-002	-005	-012	006	-026	020	019	033	015	016	-003	026	037
2	178	-	-006	034	005	006	004	016	010	015	-016	-015	-015	007	000	003	005	-005	-009
3	-156	094	-	-014	046	-002	017	026	025	-001	023	-020	-030	-022	001	-001	000	001	000
4	002	110	-030	-	067	-003	004	-012	017	006	-003	-005	009	-017	-011	-006	-019	-006	-036
5	020	132	141	104	-	-026	-017	-040	-074	-001	-020	-032	-021	-089	-036	-062	000	-052	-029
6	276	084	-554	011	-105	-	-021	-006	-034	017	-025	017	038	027	-006	003	000	-002	-001
7	731	136	-361	023	009	372	-	007	-005	012	-025	018	036	010	006	006	002	012	013
8	803	138	-304	022	-022	346	844	-	-001	007	-012	027	021	033	017	023	-005	031	042
9	611	060	-397	-079	-142	404	787	760	-	012	-031	022	029	014	011	013	004	015	028
10	550	124	-290	216	018	355	674	642	579	-	-003	-010	-001	007	-009	016	-001	003	011
11	085	-065	-072	-043	062	090	081	109	096	-065	-	-003	011	019	016	-003	013	006	001
12	218	051	-044	003	197	033	194	223	111	127	245	-	000	010	007	-007	030	005	-009
13	095	-103	045	068	-036	069	114	143	119	013	107	160	-	-003	-004	007	011	-006	-002
14	178	067	059	-017	060	100	132	191	134	031	235	224	329	-	-007	012	002	-002	002
15	236	055	-118	047	120	072	184	226	158	032	328	331	172	300	-	003	000	-001	000
16	189	011	-153	035	-047	210	177	231	169	051	368	231	187	259	617	-	000	002	001
17	231	017	-175	-030	024	213	278	249	223	138	177	206	207	182	377	238	-	000	000
18	228	-065	-106	-063	-051	134	219	195	167	031	210	248	204	263	635	473	374	-	000
19	226	-064	033	-008	060	104	191	203	163	067	271	277	217	393	532	535	283	534	-

Note: The Pre-Imputation Intercorrelation Matrix is on the lower diagonal and the Residual Matrix is on the upper diagonal. Decimals omitted.

Table E-6

Pre-imputation and Residual Means and Variances on all Criterion Measures for MOS 19E

	Pre-Imputed		Residual	
	Mean	Variance	Mean	Variance
1	4.73	0.45	0.00	0.00
2	3.38	9.36	0.04	0.09
3	0.61	1.63	0.00	0.00
4	233.65	1048.07	-0.34	-32.99
5	2.68	0.34	0.00	0.00
6	50.01	33.80	0.02	0.23
7	4.50	0.72	0.00	0.00
8	4.24	0.63	0.00	0.00
9	4.52	0.78	0.01	-0.02
10	4.66	0.94	0.00	0.02
11	30.04	30.14	0.12	-0.09
12	37.64	20.13	0.06	-0.27
13	21.03	17.59	-0.03	0.12
14	73.26	115.24	-0.16	1.41
15	41.36	51.36	-0.02	0.08
16	11.47	15.25	0.01	0.04
17	10.05	2.82	0.00	0.01
18	20.82	19.23	-0.01	0.05
19	35.15	46.27	0.00	0.19

Table E-7

Mat of Pre-imputation Intercorrelations and Residuals on all Criterion Measures for MOS 19K

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	-	063	016	-022	035	-004	007	008	007	009	006	038	005	009	025	006	012	005	009
2	224	-	004	006	-007	000	008	007	015	-004	-001	006	021	008	001	-001	000	003	-002
3	-133	-026		-002	-028	006	008	010	-008	020	-017	-007	008	018	000	-029	004	-014	-018
4	125	126	-083	-	-008	-012	001	-002	009	-013	-002	014	-013	011	-001	009	014	-005	002
5	112	113	-005	057	-	015	021	011	-006	004	-024	033	013	025	010	-002	008	011	016
6	278	115	-476	133	071	-	-019	-012	-002	-021	030	018	005	006	-001	019	005	004	-004
7	784	149	-202	154	050	344	-	002	000	004	020	026	008	000	009	000	003	007	008
8	828	167	-164	155	068	335	860	-	005	-001	016	014	-003	005	014	000	008	000	007
9	631	051	-238	086	-045	344	742	751	-	007	022	015	016	009	012	015	003	008	015
10	594	146	-190	341	083	290	695	676	554	-	006	020	-004	009	010	-002	003	007	000
11	113	000	-078	-045	-043	107	115	119	090	-015	-	001	007	-006	006	011	-019	002	012
12	169	042	032	-019	042	-050	108	114	046	046	131	-	-018	004	003	006	009	004	005
13	031	020	-015	021	044	-048	042	037	018	-008	144	287	-	007	021	008	018	012	016
14	152	069	-029	091	063	071	089	122	005	059	087	289	174	-	004	-002	002	018	009
15	116	-007	-045	-098	000	059	090	134	118	024	231	236	179	211	-	004	001	-003	003
16	096	010	-032	-057	-007	052	074	136	075	010	328	179	101	101	471	-	001	002	003
17	112	044	-042	-052	035	038	067	117	050	-012	066	089	120	109	345	211	-	002	005
18	143	041	-078	-050	084	090	148	183	134	045	257	234	202	202	573	435	317	-	001
19	163	081	-114	-056	052	087	148	179	124	034	206	271	151	298	599	383	307	548	-

Note: The Pre-Imputation Intercorrelation Matrix is on the lower diagonal and the Residual Matrix is on the upper diagonal. Decimals omitted.

Table E-8

Pre-imputation and Residual Means and Variances on all Criterion Measures for MOS 19K

	Pre-Imputed		Residual	
	Mean	Variance	Mean	Variance
1	4.74	0.55	0.00	0.01
2	3.83	12.58	0.02	0.21
3	0.36	0.68	0.00	-0.01
4	235.30	767.66	0.23	-3.18
5	2.45	0.49	0.00	0.00
6	50.00	27.97	-0.04	0.23
7	4.53	0.82	0.00	0.00
8	4.35	0.81	-0.01	0.00
9	4.59	0.92	-0.01	0.00
10	4.65	0.98	-0.01	-0.02
11	18.41	36.05	0.05	0.07
12	51.25	44.69	-0.03	-0.16
13	22.81	10.03	0.04	-0.27
14	54.77	54.56	0.09	-1.34
15	31.10	33.03	0.00	0.12
16	11.07	14.00	0.00	-0.08
17	10.11	4.21	0.01	0.06
18	25.45	20.11	0.00	0.05
19	24.33	28.20	-0.04	0.04

Table E-9

Matrix of Pre-Imputation Intercorrelations and Residuals on all Criterion Measures for MOS 31C

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	-	029	-003	026	004	019	007	-006	-008	005	-021	016	-018	062	-013	-002	-009	-017	-012	026	018
2	173	-	016	003	013	002	031	025	007	018	028	038	001	012	020	009	-009	-017	006	008	000
3	-085	-005	-	-017	015	033	-007	001	004	000	012	009	024	061	014	-005	003	010	-002	-002	001
4	135	152	-075	-	040	-030	010	016	-019	041	-008	021	-016	016	027	-007	011	-049	606	-021	-003
5	043	067	054	106	-	-008	004	-001	-005	-017	-012	-030	-008	-020	017	-018	-024	-027	-004	-010	-017
6	184	054	-367	019	006	-	020	019	015	017	004	006	-011	021	012	016	-010	026	008	021	003
7	729	137	-177	161	065	284	-	002	-001	001	026	024	004	057	008	018	012	-016	020	040	056
8	792	211	-121	144	022	250	803	-	003	-002	008	019	010	035	-015	016	020	-022	019	036	055
9	590	080	-282	051	-026	315	737	726	-	002	-010	025	-018	033	-001	015	016	-005	017	037	017
10	532	081	-175	361	015	237	621	619	537	-	002	-009	-013	030	-016	013	001	-016	007	016	035
11	137	142	-089	-012	-006	105	097	156	084	019	-	028	033	006	-006	024	008	014	-036	011	-013
12	085	136	049	095	015	049	091	116	028	027	234	-	006	016	011	029	006	013	-021	001	025
13	095	088	-020	017	071	099	114	148	050	049	235	232	-	022	040	015	018	001	018	034	012
14	216	229	-048	109	-003	021	145	162	087	059	335	226	084	-	029	012	022	015	009	039	026
15	094	159	005	075	116	088	075	084	044	-016	091	201	157	331	-	-012	010	-025	014	005	013
16	284	179	-022	031	007	127	274	293	236	152	277	353	219	186	143	-	010	-012	002	003	000
17	217	078	-062	039	-041	110	170	230	188	050	359	228	191	315	196	535	-	001	009	004	007
18	084	070	-022	-017	007	090	072	099	117	039	089	138	076	081	045	254	133	-	008	-010	-002
19	252	157	008	052	009	008	231	269	242	090	210	172	219	234	205	623	577	206	-	007	-005
20	283	185	-030	049	-045	107	232	255	224	054	306	239	198	500	311	597	695	225	637	-	-006
21	077	073	029	065	049	022	126	146	071	022	147	069	252	236	190	271	253	115	240	292	-

Note: The Pre-Imputation Intercorrelation Matrix is on the lower diagonal and the Residual Matrix is on the upper diagonal. Decimals omitted.

Table E-10

Pre-imputation and Residual Means and Variances on all Criterion Measures for MOS 31C

	Pre-Imputed		Residual	
	Mean	Variance	Mean	Variance
1	4.72	0.79	0.02	-0.03
2	2.97	8.88	-0.04	-0.22
3	0.38	0.70	0.00	0.00
4	236.96	997.84	0.05	-47.76
5	2.24	0.55	0.01	-0.01
6	50.00	22.91	0.10	0.28
7	4.67	1.00	0.02	-0.04
8	4.43	0.93	0.01	-0.03
9	4.67	1.10	0.01	-0.01
10	4.79	1.05	0.00	-0.02
11	17.61	41.45	0.03	-0.71
12	21.31	26.93	0.23	0.88
13	20.69	25.39	0.00	0.51
14	74.10	219.26	-0.44	7.96
15	11.62	3.06	0.01	0.06
16	20.96	23.03	0.04	-0.38
17	9.95	9.81	-0.01	0.04
18	6.47	5.27	0.00	0.03
19	22.84	24.05	0.07	-0.39
20	53.79	171.36	0.00	1.08
21	3.80	2.26	0.00	-0.02

Table E-11

Matrix of Pre-imputation Intercorrelations and Residuals on all Criterion Measures for MOS 63B

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	-	035	-001	-004	-012	000	000	-002	006	003	002	007	021	019	022	017	029	024
2	140	-	-004	008	005	017	021	009	007	012	-012	-012	026	-006	002	-011	005	003
3	-096	050	-	005	-003	-003	-005	000	-004	-003	019	-006	-018	008	001	-010	-011	-001
4	045	127	-024	-	005	001	005	004	-009	-005	045	002	-007	007	015	-001	019	014
5	067	073	012	087	-	016	-004	-012	-002	-001	026	036	016	012	002	-001	-002	000
6	246	056	-360	045	008	-	006	002	-005	006	-002	-024	-002	-006	-013	-003	-004	-009
7	777	128	-187	077	100	292	-	002	008	004	001	005	004	013	001	001	000	006
8	857	124	-117	114	087	278	830	-	006	009	010	-001	014	018	011	-001	005	012
9	691	017	-235	064	-009	324	728	741	-	-009	023	022	009	014	016	-001	005	007
10	543	080	-168	244	054	273	631	627	593	-	010	004	015	004	-007	-013	004	002
11	090	152	058	064	073	006	117	097	060	043	-	-017	014	031	040	034	027	026
12	167	-001	-009	005	071	-040	132	142	084	064	194	-	015	022	045	015	-002	-004
13	252	165	031	014	128	039	225	268	165	039	223	214	-	018	038	003	019	023
14	131	112	051	033	048	-010	102	112	037	-039	126	131	331	-	030	049	042	018
15	221	074	012	026	024	048	183	219	136	036	293	236	264	242	-	007	004	003
16	210	105	-062	028	-014	073	205	203	173	068	280	274	259	178	521	-	-001	001
17	309	106	017	069	023	107	257	302	181	100	222	171	353	184	511	498	-	001
18	254	096	-003	028	012	046	240	246	175	057	188	142	282	212	489	460	580	-

Note: The Pre-Imputation Intercorrelation Matrix is on the lower diagonal and the Residual Matrix is on the upper diagonal. Decimals omitted.

Table E-12

Pre-imputation and Residual Means and Variances on all Criterion Measures for MOS 63B

	Pre-Imputed		Residual	
	Mean	Variance	Mean	Variance
1	4.53	0.79	0.00	-0.02
2	2.63	7.65	0.01	-0.02
3	0.36	0.76	0.00	0.01
4	235.51	1139.60	0.31	13.98
5	2.17	0.56	0.00	0.00
6	49.99	23.95	-0.04	0.17
7	4.41	0.95	0.01	-0.01
8	4.18	0.94	0.00	-0.01
9	4.58	1.09	-0.01	-0.01
10	4.66	1.05	-0.01	-0.01
11	31.94	31.54	0.07	-0.03
12	21.51	19.30	0.04	-0.25
13	82.37	99.15	0.37	-0.56
14	9.40	9.57	-0.07	0.22
15	21.93	22.05	-0.05	0.37
16	18.62	12.98	0.01	0.08
17	57.46	155.31	0.01	1.06
18	15.64	15.52	-0.02	0.27

Table E-13

Matrix of Pre-imputation Intercorrelations and Residuals on all Criterion Measures for MOS 71L.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	-	-007	-021	-012	010	041	011	007	007	011	024	020	003	013	006	016
2	160	-	006	011	006	011	-032	-017	-009	-009	016	-003	009	004	-009	-002
3	-103	030	-	-017	002	-015	-019	-016	-011	-007	001	-001	-009	002	002	-002
4	131	182	-116	-	030	007	010	-005	-006	-012	012	017	030	014	017	003
5	059	178	-029	176	-	-017	-001	-003	-005	-015	007	-013	000	003	011	004
6	213	095	-278	059	066	-	051	034	030	029	-016	-016	035	-001	004	011
7	756	143	-174	228	077	283	-	004	006	005	020	007	009	008	025	014
8	811	195	-152	204	081	259	841	-	008	-001	014	022	003	005	013	-005
9	680	091	-203	129	066	251	667	717	-	013	014	009	019	009	018	021
10	572	139	-186	351	057	219	607	652	527	-	024	025	016	004	-003	-010
11	094	140	-020	063	141	040	111	139	099	102	-	-001	001	006	019	008
12	111	051	-027	125	066	-038	132	155	136	118	271	-	-012	007	013	002
13	233	194	-035	057	110	112	207	268	209	163	338	230	-	001	-002	002
14	102	120	-043	030	079	063	116	132	107	047	507	205	376	-	003	002
15	088	081	003	062	049	044	127	132	127	053	312	229	298	465	-	-002
16	198	159	-051	-018	-024	157	201	226	153	079	340	157	521	478	384	-

Note: The Pre-Imputation Intercorrelation Matrix is on the lower diagonal and the Residual Matrix is on the upper diagonal. Decimals omitted

Table E-14

Pre-imputation and Residual Means and Variances on all Criterion Measures for MOS 71L

	Pre-Imputed Mean	Pre-Imputed Variance	Residual Mean	Residual Variance
1	4.89	0.78	0.01	0.00
2	3.08	10.23	0.02	0.14
3	0.34	0.59	0.00	0.00
4	237.57	1108.59	0.52	-42.34
5	1.33	0.58	0.00	0.00
6	50.00	21.06	0.01	0.18
7	4.88	1.01	0.00	-0.03
8	4.57	0.92	0.00	-0.02
9	4.98	1.11	0.01	0.02
10	5.10	1.13	0.00	0.00
11	17.91	28.74	0.10	0.24
12	20.33	24.07	0.06	-0.10
13	72.02	228.06	0.04	-1.38
14	23.60	25.41	0.07	0.21
15	16.28	9.50	0.03	-0.07
16	29.03	46.58	0.02	0.29

Table E-15

Matrix of Pre-imputation Intercorrelations and Residuals on all Criterion Measures for MOS 88M

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	-	-003	-011	024	007	015	006	-003	-009	-008	009	016	028	-002	-015	000	-005
2	241	-	000	009	007	-010	-004	-003	-020	-002	-008	-016	[illegible]	002	010	007	010
3	-075	124	-	002	000	-016	-014	-012	-010	-013	004	-001	-017	-001	000	006	007
4	064	123	-011	-	-007	002	050	038	028	040	013	020	025	-010	015	-003	-001
5	101	145	004	081	-	000	001	001	-004	044	015	020	012	-008	006	-001	005
6	238	160	-398	062	020	-	000	003	003	-033	-012	-016	013	-013	-001	-020	-016
7	760	173	-157	177	080	320	-	002	-002	005	011	021	023	006	007	002	002
8	812	248	-129	107	108	325	849	-	-003	000	019	012	032	002	000	002	001
9	671	104	-223	051	-002	319	753	788	-	-003	005	001	019	-003	-003	-007	-007
10	558	137	-197	263	056	286	660	624	572	-	-011	-016	018	-006	004	-008	-012
11	166	132	002	002	162	127	171	220	079	029	-	006	-001	022	-004	011	033
12	162	080	044	039	132	024	144	159	072	056	355	-	-002	007	-012	015	003
13	160	058	-063	043	080	068	090	090	015	037	187	132	-	011	014	003	010
14	216	141	-007	-051	125	139	217	242	158	056	[illegible]	261	100	-	007	-002	-001
15	033	081	021	049	071	-058	-015	-008	-041	025	027	093	008	098	-	007	012
16	170	182	022	-040	020	075	169	200	088	019	335	353	105	619	124	-	-005
17	146	123	-027	-008	088	096	151	169	122	-036	359	248	138	630	114	611	-

Note: The Pre-Imputation Intercorrelation Matrix is on the lower diagonal and the Residual Matrix is on the upper diagonal. Decimals omitted

Table E-16

Pre-imputation and Residual Means and Variances on all Criterion Measures for MOS 88M

	Pre-Imputed		Residual	
	Mean	Variance	Mean	Variance
1	[illegible]	0.56	0.02	-0.03
2	3.55	12.00	-0.01	0.06
3	0.44	0.87	0.00	0.00
4	230.82	1361.41	-0.15	-40.13
5	2.02	0.54	0.00	0.00
6	50.00	25.21	-0.02	0.07
7	4.49	0.91	0.00	0.00
8	4.29	0.82	0.01	-0.02
9	4.52	0.95	0.01	0.00
10	4.69	0.93	0.01	0.00
11	40.18	115.58	0.23	0.76
12	75.27	94.23	0.16	-2.14
13	32.07	41.92	0.10	1.09
14	25.19	33.27	0.03	0.04
15	2.11	1.75	0.01	0.01
16	34.09	33.05	0.00	-0.05
17	33.27	49.17	0.00	-0.32

Table E-17

Matrix of Pre-imputation Intercorrelations and Residuals on all Criterion Measures for MOS 91A

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	-	011	012	017	013	001	-015	-011	-011	-022	-015	010	005	-006	-023	012	020	014
2	229	-	008	-005	014	003	004	006	009	002	-005	-008	004	010	-010	014	015	009
3	-150	-033	-	007	-005	002	-004	-001	-008	002	002	-004	-009	011	003	006	001	008
4	123	199	-084	-	013	-021	009	005	006	025	-004	-001	001	-024	-013	-006	004	-024
5	122	106	-003	135	-	-002	009	002	-006	004	-008	-005	-013	000	004	-015	-006	-016
6	258	134	-401	132	026	-	-005	-002	-009	-004	001	008	005	-008	002	-006	005	002
7	749	205	-269	133	066	299	-	-001	-002	-002	-016	005	003	004	-015	010	013	018
8	789	241	-252	126	064	331	853	-	000	-003	-014	004	007	-001	-018	012	010	020
9	638	125	-282	058	-017	310	756	784	-	-005	-010	002	003	-006	-013	001	006	008
10	542	170	-229	391	050	241	648	663	539	-	-017	-011	-006	-013	-016	006	003	003
11	162	135	-038	071	102	100	152	219	165	129	-	-012	-006	003	007	-009	006	-007
12	269	153	-142	125	151	201	253	268	191	122	311	-	-008	009	005	006	012	017
13	277	116	-134	021	022	193	241	272	238	116	291	372	-	010	013	001	006	013
14	228	123	-052	012	185	115	216	288	185	121	482	350	357	-	008	005	-002	-007
15	050	066	-025	-032	142	081	064	070	066	-010	149	151	120	243	-	007	002	012
16	218	094	-082	-026	113	140	199	252	169	089	329	374	410	618	222	-	-001	000
17	011	122	051	008	147	-002	-006	021	-052	-044	225	187	127	322	130	321	-	-007
18	226	033	-049	-037	093	161	211	263	186	091	297	291	423	600	206	767	243	-

Note: The Pre-Imputation Intercorrelation Matrix is on the lower diagonal and the Residual Matrix is on the upper diagonal.
Decimals omitted.

Table E-18

Pre-imputation and Residual Means and Variances on all Criterion Measures for MOS 91A

	Pre-Imputed Mean	Pre-Imputed Variance	Residual Mean	Residual Variance
1	4.73	0.63	0.00	-0.03
2	3.57	10.56	0.00	0.14
3	0.39	0.65	0.00	-0.01
4	218.30	1156.50	0.38	-8.12
5	2.18	0.60	0.01	0.00
6	50.00	26.70	-0.01	0.16
7	4.63	0.96	-0.01	0.00
8	4.44	0.88	0.00	-0.01
9	4.61	1.06	0.00	-0.02
10	4.83	1.05	0.00	0.00
11	9.60	13.32	0.03	-0.23
12	33.20	29.29	0.02	0.02
13	92.24	142.40	0.09	-1.13
14	14.21	14.27	-0.04	-0.02
15	6.37	4.93	0.04	0.06
16	42.74	62.40	0.01	0.26
17	1.40	0.91	0.01	0.02
18	77.18	167.42	-0.01	-1.56

Table E-19

Matrix of Pre-imputation Intercorrelations and Residuals on all Criterion Measures for MOS 95B

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	-	001	009	004	-009	-005	006	-001	006	004	-007	-003	-001	-012	-001	000	007	010	000	-004
2	177	-	-001	029	000	-004	006	003	004	002	004	-004	-001	008	009	-012	007	-006	-001	-009
3	-172	010	-	017	-017	001	017	006	001	005	009	-010	-011	-003	004	009	-013	000	011	-012
4	077	139	-161	-	-009	-011	005	006	009	009	003	014	-028	-012	-026	-037	-017	-028	-030	001
5	111	137	-045	076	-	000	-008	-011	-010	-006	002	-018	002	006	-003	-009	-004	-010	-003	004
6	137	177	-334	186	-026	-	-001	000	001	-001	012	001	000	015	008	002	-003	007	001	013
7	811	188	-228	182	076	281	-	000	000	001	008	006	003	000	000	-002	011	002	000	000
8	830	213	-197	121	111	238	900	-	000	000	-004	-001	-002	-001	003	001	001	004	000	-003
9	672	111	-224	076	015	249	764	755	-	000	004	-004	-002	001	000	001	002	005	-001	003
10	619	129	-316	382	088	237	720	665	560	-	-009	-003	-006	-002	-003	-006	007	003	-002	-002
11	207	063	-032	-035	145	089	210	202	149	135	-	006	003	005	010	008	-005	007	008	-006
12	144	090	040	009	078	048	139	141	106	124	277	-	-002	004	000	-003	002	-003	008	-002
13	184	-043	-042	-097	077	037	128	159	065	097	259	162	-	000	004	-002	014	003	006	012
14	167	119	009	056	110	053	166	182	102	165	192	188	143	-	004	-005	010	003	014	002
15	122	014	-042	-077	151	085	069	110	063	-024	297	151	220	125	-	002	010	003	005	005
16	081	-017	-005	-083	090	027	044	085	101	-026	213	170	156	199	632	-	011	-002	010	002
17	132	031	-103	-033	052	068	084	072	028	027	125	033	121	035	242	172	-	008	003	001
18	101	007	-024	-053	074	088	120	137	146	015	232	228	128	116	594	541	171	-	006	-001
19	104	-006	-070	-063	066	053	110	130	129	-040	187	120	186	093	618	521	199	615	-	005
20	-037	-076	023	-097	-004	048	-006	004	027	-080	052	017	101	-032	192	091	124	212	186	-

Note: The Pre-Imputation Intercorrelation Matrix is on the lower diagonal and the Residual Matrix is on the upper diagonal. Decimals omitted.

Table E-20

Pre-imputation and Residual Means and Variances on all Criterion Measures for MOS 95B

	Pre-Imputed Mean	Pre-Imputed Variance	Residual Mean	Residual Variance
1	4.66	0.49	0.00	0.00
2	3.06	8.42	0.02	0.10
3	0.38	0.67	-0.01	-0.01
4	234.34	962.22	0.37	-42.51
5	2.15	0.59	-0.01	0.00
6	50.00	25.87	0.02	0.11
7	4.64	0.82	0.00	0.00
8	4.35	0.69	0.00	0.00
9	4.71	0.82	0.00	0.00
10	4.80	0.99	0.00	0.00
11	68.41	103.78	0.02	-0.14
12	20.72	18.33	0.04	0.09
13	29.43	30.94	-0.01	0.35
14	10.24	4.53	-0.01	0.04
15	39.03	63.06	-0.05	0.63
16	13.92	23.79	-0.03	0.03
17	6.38	4.75	0.00	-0.02
18	24.22	22.00	0.00	0.15
19	39.59	39.07	-0.02	0.31
20	1.10	0.46	0.01	0.00

Appendix F

LVI JOB PERFORMANCE MEASURE SUMMARY STATISTICS
FOR 10 MOS

Job Performance Measure Summary Statistics
For 11B: Infantry

#	Variable	MN	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Overall Rating	4.63	0.89	.	86	73	71	82	23	-22	12	38	27	18	13	29	18	12	17
2	Eff/Ldr Rating	4.43	0.86	86	.	75	68	87	23	-24	9	35	34	22	15	33	22	12	14
3	Discipline Rtng	4.62	0.92	73	75	.	53	67	12	-32	-2	37	20	12	11	25	16	11	12
4	Fitness Rating	4.78	0.94	71	68	53	.	68	20	-18	25	33	13	13	7	6	4	1	3
5	MOS Rating	4.67	0.70	82	87	67	68	.	21	-20	11	31	31	19	12	30	20	10	13
6	Awards/Cert	3.59	3.17	23	23	12	20	21	.	-3	12	10	12	7	7	11	9	5	12
7	Article 15s	0.34	0.81	-22	-24	-32	-18	-20	-3	.	6	-43	-14	-10	-11	-14	-11	-9	-3
8	Phys Readiness	252.9	28.91	12	9	-2	25	11	12	6	.	2	1	13	3	-2	-2	-3	0
9	Promotion Rate	50.02	5.04	38	35	37	33	31	10	-43	2	.	17	12	5	19	12	5	13
10	HO Basic	95.32	13.44	27	34	20	13	31	12	-14	1	17	.	36	15	49	37	17	19
11	HO Safety	22.49	3.81	16	22	12	13	19	7	-10	13	12	36	.	8	32	31	11	10
12	HO Comm	11.88	2.31	13	15	11	7	12	7	-11	3	5	15	8	.	14	13	13	6
13	JK Basic	78.23	14.75	29	33	25	6	30	11	-14	-2	19	49	32	14	.	71	37	40
14	JK Safety	21.32	4.38	18	22	16	4	20	9	-11	-2	12	37	31	13	71	.	34	34
15	JK Comm	3.85	1.70	12	12	11	1	10	5	-9	-3	5	17	11	13	37	34	.	20
16	JK Identify	7.25	2.59	17	14	12	3	13	12	-3	0	13	19	10	6	40	34	20	.

N=896

Job Performance Measure Summary Statistics
For 13B: Cannon Crewman

#	Variable	MN	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Overall Rating	4.50	0.91	.	83	71	64	67	24	-29	10	37	20	15	13	0	29	23	21	7	7
2	Eff/Ldr Rating	4.29	0.87	83	.	70	61	75	30	-25	10	36	21	17	17	2	29	22	22	7	10
3	Discipline Rtng	4.51	0.93	71	70	.	50	56	17	-30	3	33	7	11	13	-3	27	21	21	8	10
4	Fitness Rating	4.73	0.94	64	61	50	.	53	23	-29	24	34	12	-3	5	-4	11	4	2	-1	0
5	MOS Rating	4.69	0.69	67	75	56	53	.	27	-18	9	25	28	19	16	4	30	18	20	9	10
6	Awards/Cert	3.05	2.96	24	30	17	23	27	.	-8	15	15	14	7	3	-2	7	6	5	1	-0
7	Article 15s	0.56	0.99	-29	-25	-30	-29	-18	-8	.	-4	-46	-3	-5	-4	-5	-9	-8	-6	-7	-5
8	Phys Readiness	243.2	34.64	10	10	3	24	9	15	-4	.	-0	3	-1	-5	3	-3	-7	-3	-10	-0
9	Promotion Rate	49.76	5.23	37	36	33	34	25	15	-46	-0	.	16	8	13	6	16	20	13	8	5
10	HO Tech	43.60	12.42	20	21	7	12	28	14	-3	3	16	.	35	20	11	33	19	14	13	9
11	HO Basic	41.02	12.45	15	17	11	-3	19	7	-5	-1	8	35	.	21	17	41	39	32	14	12
12	HO Safety	32.98	5.49	13	17	13	5	16	3	-4	-5	13	20	21	.	5	21	20	21	12	5
13	HO Comm	8.32	3.18	0	2	-3	-4	4	-2	-5	3	6	11	17	5	.	7	11	12	1	6
14	JK Tech	46.61	11.31	29	29	27	11	30	7	-9	-3	16	33	41	21	7	.	63	57	20	27
15	JK Basic	29.86	6.38	23	22	21	4	18	6	-8	-7	20	19	39	20	11	63	.	66	20	28
16	JK Safety	22.63	5.13	21	22	21	2	20	5	-6	-3	13	14	32	21	12	57	66	.	22	23
17	JK Comm	1.06	0.70	7	7	8	-1	9	1	-7	-10	8	13	14	12	1	20	20	22	.	12
18	JK Identify	5.99	2.12	7	10	10	0	10	-0	-5	-0	5	9	12	5	6	27	28	23	12	.

N=801

Job Performance Measure Summary Statistics
For 19E: M60 Armor Crewman

#	Variable	MN	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Overall Rating	4.50	0.85	.	84	79	67	73	13	-36	3	37	13	21	11	8	19	19	22	17	28
2	Eff/Ldr Rating	4.24	0.79	84	.	76	64	80	13	-30	3	34	19	24	14	12	20	23	20	22	25
3	Discipline Rtng	4.52	0.88	79	76	.	58	61	5	-40	-9	40	14	12	12	10	16	16	17	16	22
4	Fitness Rating	4.66	0.97	67	64	58	.	55	11	-29	21	36	3	14	1	-6	7	4	4	5	14
5	MOS Rating	4.73	0.67	73	80	61	55	.	18	-16	2	28	17	24	10	10	22	24	23	18	23
6	Awards/Cert	3.30	3.06	13	13	5	11	18	.	-12	9	9	-1	7	-8	-5	-7	5	-7	1	1
7	Article 15s	0.58	1.20	-36	-30	-40	-29	-16	-12	.	-0	-52	6	-6	6	-7	-1	-14	-16	-17	-16
8	Phys Readiness	234.2	33.09	3	3	-9	21	2	9	-0	.	2	1	2	5	-2	5	6	-4	5	-2
9	Promotion Rate	50.16	5.51	37	34	40	35	28	9	-52	2	.	8	4	5	6	13	10	15	21	23
10	HO Tech	73.35	10.61	13	19	14	3	17	-1	6	1	8	.	18	33	21	38	30	24	24	20
11	HO Basic	37.60	4.36	21	24	12	14	24	7	-6	2	4	18	.	14	25	27	31	21	24	20
12	HO Safety	21.06	4.14	11	14	12	1	10	-8	6	5	5	33	14	.	11	23	17	20	19	22
13	HO Comm	29.99	5.46	8	12	10	-6	10	-5	-7	-2	6	21	25	11	.	27	32	19	37	18
14	JK Tech	35.11	6.73	19	20	16	7	22	-7	-1	5	13	38	27	23	27	.	53	52	53	30
15	JK Basic	41.30	7.20	19	23	16	4	24	5	-14	6	10	30	31	17	32	53	.	64	62	38
16	JK Safety	20.82	4.35	22	20	17	4	23	-7	-16	-4	15	24	21	20	19	52	64	.	47	41
17	JK Comm	11.50	3.93	17	22	16	5	18	1	-17	5	21	24	24	19	37	53	62	47	.	24
18	JK Identify	10.05	1.68	28	25	22	14	23	1	-16	-2	23	20	20	22	18	30	38	41	24	.

N=241

Job Performance Measure Summary Statistics
For 19K: M1 Armor Crewman

#	Variable	MN	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Overall Rating	4.53	0.91	.	86	74	70	78	15	-20	18	35	10	10	4	9	14	9	15	7	7
2	Eff/Ldr Rating	4.35	0.90	86	.	75	68	83	17	-16	17	34	13	12	5	10	18	14	19	14	12
3	Discipline Rtng	4.59	0.96	74	75	.	55	63	6	-23	10	35	2	5	1	6	12	12	13	7	5
4	Fitness Rating	4.65	0.99	70	68	55	.	59	15	-20	36	30	6	4	-1	-3	3	2	5	1	-1
5	MOS Rating	4.74	0.74	78	83	63	59	.	23	-14	15	28	15	16	3	10	16	11	14	9	11
6	Awards/Cert	3.79	3.51	15	17	6	15	23	.	-3	11	12	5	3	-2	1	9	2	5	3	5
7	Article 15s	0.36	0.84	-20	-16	-23	-20	-14	-3	.	-7	-46	-5	3	-2	-6	-10	-5	-6	0	-5
8	Phys Readiness	235	27.30	18	17	10	36	15	11	-7	.	14	7	-3	3	-4	-6	-10	-4	-7	-6
9	Promotion Rate	49.96	5.23	35	34	35	30	28	12	-46	14	.	7	-5	-6	7	8	6	8	1	4
10	HO Tech	54.91	7.42	10	13	2	6	15	5	-5	7	7	.	29	17	10	29	21	19	11	10
11	HO Basic	51.45	6.65	10	12	5	4	16	3	3	-3	-5	29	.	30	14	28	25	25	20	9
12	HO Safetv	22.76	3.22	4	5	1	-1	3	-2	-2	3	-6	17	30	.	14	13	17	19	10	12
13	HO Comm	18.31	5.98	9	10	6	-3	10	1	-6	-4	7	10	14	14	.	18	21	24	32	9
14	JK Tech	24.35	5.36	14	18	12	3	16	9	-10	-6	8	29	28	13	18	.	59	54	37	30
15	JK Basic	31.12	5.73	9	14	12	2	11	2	-5	-10	6	21	25	17	21	59	.	58	46	35
16	JK Safety	25.45	4.50	15	19	13	5	14	5	-6	-4	8	19	25	19	24	54	58	.	42	32
17	JK Comm	11.05	3.69	7	14	7	1	9	3	0	-7	1	11	20	10	32	37	46	42	.	21
18	JK Identify	10.12	2.06	7	12	5	-1	11	5	-5	-6	4	10	9	12	9	30	35	32	21	.

N=780

Job Performance Measure Summary Statistics
For 31C: Single Channel Radio Operator

#	Variable	MN	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	Overall Rating	4.66	1.00	.	81	74	62	74	14	-18	14	27	12	8	14	9	9	23	28	24	17	12	9
2	Eff/Ldr Rating	4.43	0.97	81	.	74	62	80	21	-14	14	24	14	10	17	16	10	24	29	26	21	13	11
3	Discipline Rtng	4.67	1.05	74	74	.	54	60	10	-29	6	30	6	0	8	10	5	21	23	24	18	6	13
4	Fitness Rating	4.79	1.03	62	62	54	.	54	9	-17	32	22	3	3	7	1	1	5	15	9	5	2	6
5	MOS Rating	4.72	0.89	74	80	60	54	.	15	-9	12	16	16	7	12	14	11	27	28	26	21	7	10
6	Awards/Cert	2.99	3.04	14	21	10	9	15	.	-2	15	5	22	8	9	12	13	18	17	14	9	7	8
7	Article 15s	0.38	0.83	-18	-14	-29	-17	-9	-2	.	-3	-36	-4	3	-0	-10	1	-1	-1	2	-4	4	-4
8	Phys Readiness	236.8	32.46	14	14	6	32	12	15	-3	.	2	11	8	5	-1	4	8	5	6	1	9	3
9	Promotion Rate	49.82	4.73	27	24	30	22	16	5	-36	2	.	2	4	11	11	8	9	11	9	11	3	7
10	HO Tech	74.75	14.08	12	14	6	3	16	22	-4	11	2	.	23	8	31	30	45	17	19	28	19	6
11	HO Basic	21.15	5.13	8	10	0	3	7	8	3	8	4	23	.	24	20	22	25	32	18	22	4	13
12	HO Safety	20.64	5.01	14	17	8	7	12	9	-0	5	11	8	24	.	21	14	18	22	21	18	25	9
13	HO Comm	17.71	6.39	9	16	10	1	14	12	-10	-1	11	31	20	21	.	9	28	24	21	34	13	6
14	HO Vehicle	11.60	1.74	9	10	5	1	11	13	1	4	8	30	22	14	9	.	32	17	20	21	18	7
15	JK Tech	53.90	12.89	23	24	21	5	27	18	-1	8	9	45	25	18	28	32	.	59	62	69	28	23
16	JK Basic	20.96	4.82	28	29	23	15	28	17	-1	5	11	17	32	22	24	17	59	.	61	52	26	25
17	JK Safety	22.83	4.85	24	26	24	9	26	14	2	6	9	19	18	21	21	20	62	61	.	57	21	17
18	JK Comm	9.97	3.06	17	21	18	5	21	9	-4	1	11	28	22	18	34	21	69	52	57	.	24	11
19	JK Vehicle	3.79	1.49	12	13	6	2	7	7	4	9	3	19	4	25	13	18	28	26	21	24	.	11
20	JK Identify	6.42	2.30	9	11	13	6	10	8	-4	3	7	6	13	9	6	7	23	25	17	11	11	.

N=483

Job Performance Measure Summary Statistics
For 63B: Light Wheel Vehicle Mechanic

#	Variable	MN	SD	1	2	3	4	5	5	7	8	9	10	11	12	13	14	15	16	17
1	Overall Rating	4.42	0.98	.	83	73	63	77	12	-19	8	29	23	11	13	9	26	18	21	24
2	Eff/Ldr Rating	4.18	0.97	83	.	74	63	86	12	-12	12	28	26	8	14	10	30	21	21	24
3	Discipline Rtng	4.58	1.04	73	74	.	60	69	1	-24	8	33	16	4	7	2	18	13	18	18
4	Fitness Rating	4.56	1.03	63	63	60	.	55	8	-17	25	28	3	3	7	-4	10	4	8	6
5	MOS Rating	4.54	0.89	77	86	69	55	.	12	-10	6	24	24	8	17	11	28	19	20	23
6	Awards/Cert	2.60	2.75	12	12	1	[illegible]	12	.	6	11	4	14	16	1	11	11	8	11	9
7	Article 15s	0.37	0.88	-19	-12	-24	-17	-10	6	.	-3	-37	5	4	0	4	3	1	-5	0
8	Phys Readiness	234.9	33.92	8	12	8	25	6	11	-3	.	5	2	2	1	2	6	2	3	2
9	Promotion Rate	50.12	4.87	29	28	33	28	24	4	-37	5	.	3	0	-0	-1	12	6	10	6
10	HO Tech	82.11	9.94	23	26	16	3	24	14	5	2	3	.	21	21	31	34	23	27	27
11	HO Basic	31.86	5.61	11	8	4	3	8	16	4	2	0	21	.	22	10	20	24	24	16
12	HO Safety	21.44	4.43	13	14	7	7	17	1	0	1	-0	21	22	.	12	17	19	27	14
13	HO Vehicle	9.50	3.05	9	10	2	-4	11	11	4	2	-1	31	10	12	.	14	22	13	21
14	JK Tech	57.52	12.55	26	30	18	10	28	11	3	6	12	34	20	17	14	.	51	50	58
15	JK Basic	22.04	4.67	18	21	13	4	19	2	1	2	6	23	24	19	22	51	.	52	49
16	JK Safety	18.59	3.58	21	21	18	8	20	11	-5	3	10	27	24	27	13	50	52	.	46
17	JK Vehicle	15.62	3.93	24	24	18	6	23	9	0	2	6	27	16	14	21	58	49	46	.

N=721

Job Performance Measure Summary Statistics
For 71L: Administrative Specialist

#	Variable	MN	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Overall Rating	4.88	1.01	.	84	67	61	75	14	-17	21	26	20	10	13	20	12	13
2	Eff/Ldr Rating	4.57	0.95	84	.	72	64	81	18	-15	21	25	26	12	14	23	13	13
3	Discipline Rtng	4.99	1.05	67	72	.	52	68	9	-21	12	24	20	9	15	15	9	12
4	Fitness Rating	5.11	1.05	61	64	52	.	56	12	-18	36	21	15	6	10	8	4	5
5	MOS Rating	4.89	0.88	75	81	68	56	.	14	-10	13	21	23	8	11	19	9	10
6	Awards/Cert	2.93	3.04	14	18	9	12	14	.	1	17	11	19	14	2	17	11	8
7	Article 15s	0.33	0.77	-17	-15	-21	-18	-10	1	.	-10	-27	-5	-3	-4	-6	-6	-1
8	Phys Readiness	236.7	33.37	21	21	12	36	13	17	-10	.	5	6	8	12	0	3	6
9	Promotion Rate	50.02	4.58	26	25	24	21	21	11	-27	5	.	8	6	-1	16	6	2
10	HO Tech	72.04	14.91	20	26	20	15	23	19	-5	6	8	.	35	24	51	39	30
11	HO Basic	17.78	5.32	10	12	9	8	8	14	-3	6	6	35	.	27	34	49	29
12	HO Safety	20.18	4.90	13	14	15	10	11	2	-4	12	-1	24	27	.	15	19	20
13	JK Tech	28.98	6.72	20	23	15	8	19	17	-6	0	16	51	34	15	.	48	39
14	JK Basic	23.45	4.95	12	13	9	4	9	11	-6	3	6	39	49	19	48	.	45
15	JK Safety	16.23	3.07	13	13	12	5	10	8	-1	6	2	30	29	20	39	45	.

N=522

Job Performance Measure Summary Statistics
For 88M: Motor Transport Operator

#	Variable	MN	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Overall Rating	4.49	0.95	.	85	75	66	75	17	-15	13	32	17	13	8	22	17	16	-2
2	Eff/Ldr Rating	4.30	0.90	85	.	78	62	81	25	-12	7	33	21	15	8	25	20	18	-1
3	Discipline Rtng	4.52	0.97	75	78	.	57	67	11	-21	1	32	8	7	1	17	10	14	-4
4	Fitness Rating	4.70	0.96	66	62	57	.	56	13	-19	22	29	5	7	3	6	3	-2	2
5	MOS Rating	4.80	0.76	75	81	67	56	.	25	-6	3	23	17	15	15	22	17	16	5
6	Awards/Cert	3.73	3.45	17	25	11	13	25	.	12	12	17	14	9	7	14	18	12	7
7	Article 15s	0.44	0.93	-15	-12	-21	-19	-6	12	.	-0	-39	-1	4	-4	-0	2	-3	3
8	Phys Readiness	230.8	37.39	13	7	1	22	3	12	-0	.	6	-0	2	2	-3	-3	1	3
9	Promotion Rate	50.00	5.01	32	33	32	29	23	17	-39	6	.	15	5	6	15	10	11	-6
10	HO Basic	40.02	10.76	17	21	8	5	17	14	-1	-0	15	.	35	19	46	33	32	3
11	HO Safety	75.00	9.87	13	15	7	7	15	9	4	2	5	35	.	14	26	34	24	10
12	HO Vehicle	31.96	6.35	8	8	1	3	15	7	-4	2	6	19	14	.	9	11	12	-1
13	JK Basic	25.16	5.78	22	25	17	6	22	14	-0	-3	15	46	26	9	.	62	64	9
14	JK Safety	34.04	5.79	17	20	10	3	17	18	2	-3	10	33	34	11	62	.	63	12
15	JK Vehicle	33.29	7.01	16	18	14	-2	16	12	-3	1	11	32	24	12	64	63	.	10
16	JK Identity	2.11	1.32	-2	-1	-4	2	5	7	3	3	-6	3	10	-1	9	12	10	.

N=662

Job Performance Measure Summary Statistics
For 91A: Medical Specialist

#	Variable	MN	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Overall Rating	4.63	0.98	.	85	75	65	76	21	-27	13	30	23	16	25	19	21	19	-2	7
2	Eff/Ldr Rating	4.44	0.94	85	.	79	66	80	24	-26	13	33	27	23	27	25	29	25	1	8
3	Discipline Rtng	4.62	1.03	75	79	.	54	65	13	-29	5	31	24	18	19	18	19	17	-6	7
4	Fitness Rating	4.84	1.02	65	66	54	.	56	17	-24	37	24	12	14	13	9	12	8	-5	0
5	MOS Rating	4.73	0.81	76	80	65	56	.	22	-17	11	26	27	17	26	21	23	21	-1	6
6	Awards/Cert	3.57	3.24	21	24	13	17	22	.	-4	20	13	11	13	16	2	10	7	11	7
7	Article 15s	0.40	0.82	-27	-26	-29	-24	-17	-4	.	-8	-41	-13	-4	-14	-6	-6	-9	6	-3
8	Phys Readiness	237.8	34.14	13	13	5	37	11	20	-8	.	15	2	8	12	-1	3	-2	0	-1
9	Promotion Rate	50.00	5.16	30	33	31	24	26	13	-41	15	.	19	11	19	16	12	15	-1	9
10	HO Tech	92.08	11.98	23	27	24	12	27	11	-13	2	19	.	29	38	41	35	41	12	11
11	HO Basic	9.60	3.67	16	23	18	14	17	13	-4	8	11	29	.	32	30	48	33	21	13
12	HO Safety	33.18	5.41	25	27	19	13	26	16	-14	12	19	38	32	.	27	34	36	17	14
13	JK Tech	77.19	12.92	19	25	18	9	21	2	-6	-1	16	41	30	27	.	60	77	25	20
14	JK Basic	14.17	3.77	21	29	19	12	23	10	-6	3	12	35	48	34	60	.	61	32	24
15	JK Safety	42.75	7.82	19	25	17	8	21	7	-9	-2	15	41	33	36	77	61	.	32	21
16	JK Vehicle	1.39	0.95	-2	1	-6	-5	-1	11	6	0	-1	12	21	17	25	32	32	.	13
17	JK Identify	6.35	2.20	7	8	7	0	6	7	-3	-1	9	11	13	14	20	24	21	13	.

N=801

Job Performance Measure Summary Statistics
For 95B: Military Police

#	Variable	MN	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	Overall Rating	4.64	0.91	.	90	76	72	81	18	-23	18	28	13	20	13	17	11	7	12	5	-1	7
2	Eff/Ldr Rating	4.35	0.83	90	.	76	66	83	21	-20	12	24	16	20	14	18	13	11	14	9	1	7
3	Discipline Rtng	4.71	0.91	76	76	.	[illegible]	67	11	-23	7	25	7	15	11	10	13	6	14	10	2	3
4	Fitness Rating	4.80	0.99	72	66	55	.	61	12	-32	38	24	10	14	12	17	-4	-2	2	-2	-8	2
5	MOS Rating	4.66	0.70	81	83	67	61	.	17	-18	7	14	18	21	14	18	10	12	9	8	-3	13
6	Awards/Cert	3.04	2.88	18	21	11	12	17	.	1	11	18	-5	5	9	11	-1	2	2	-0	-7	2
7	Article 15s	0.38	0.83	-23	-20	-23	-32	-18	1	.	-18	-34	-3	-3	5	1	-8	-5	-3	-2	4	-9
8	Phys Readiness	233.9	31.81	18	12	7	38	7	11	-18	.	20	-6	-3	-0	7	-3	-5	-3	-5	-10	-2
9	Promotion Rate	49.97	5.08	28	24	25	24	14	18	-34	20	.	4	8	5	4	5	8	8	2	4	7
10	HO Tech	29.47	5.48	13	16	7	10	18	-5	-3	-6	4	.	24	15	14	18	22	14	17	9	11
11	HO Basic	68.48	10.02	20	20	15	14	21	5	-3	-3	8	24	.	26	18	18	30	24	22	6	14
12	HO Safety	20.70	4.25	13	14	11	12	14	9	5	-0	5	15	26	.	18	11	15	24	18	2	3
13	HO Vehicle	10.25	2.12	17	18	10	17	18	11	1	7	4	14	18	18	.	8	12	12	21	-3	3
14	JK Tech	39.62	6.23	11	13	13	-4	10	-1	-8	-3	5	18	18	11	8	.	61	61	51	18	20
15	JK Basic	39.06	7.90	7	11	6	-2	12	2	-5	-5	8	22	30	15	12	61	.	59	63	19	23
16	JK Safety	24.21	4.67	12	14	14	2	9	2	-3	-3	8	14	24	24	12	61	59	.	54	21	16
17	JK Comm	13.94	4.87	5	9	10	-2	8	-0	-2	-5	2	17	22	18	21	51	63	54	.	9	16
18	JK Vehicle	1.10	0.68	-1	1	2	-8	-3	-7	4	-10	4	9	6	2	-3	18	19	21	9	.	12
19	JK Identify	6.37	2.19	7	7	3	2	13	2	-9	-2	7	11	14	3	3	20	23	16	16	12	.

N=451